

29 JULY 1988



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# ***JPRS Report—***

# **Science & Technology**

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***USSR: Chemistry***

# Science & Technology

## USSR: Chemistry

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**Use of EPR for Studying Chemical Composition of Atmospheric Aerosols**

18410314a DOKLADY AKADEMII NAUK SSSR in Russian Vol 299 No 5, Apr 88 (manuscript received 6 Aug 87) pp 1150-1152

[Article by S.A. Dzyuba, S.G. Pushkin, and Yu.D. Tsvetkov, corresponding member, USSR Academy of Sciences, Chemical Kinetics and Combustion Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk; Coal Institute, Siberian Department, USSR Academy of Sciences, Kemerovo]

[Abstract] A study was made of the possibilities of the EPR method for analysis of the composition of industrial aerosols. Samples were taken using several types of filters with sampling times from 10 minutes to 5 hours (samples ranging from 1 to 20 mg). The composition is variable depending on meteorological conditions and sampling region. Many of the aerosol elements produce an EPR signal. The rolled filters were placed in the resonator of several types of EPR spectrometer. Spectra were registered in the absence of saturation. The g-factors were measured, and the number of spins was determined. Typical EPR spectra are illustrated. At room temperature two types of signals were registered (narrow and wide). The g-factor for the narrow signal is 2.0029 plus or minus 0.0002. The wide signal for different samples falls in the interval 2.09-2.14. A temperature decrease gives rise to a six-component spectrum (at room temperature it cannot be resolved against the background of a strong wide line). The EPR spectra were registered at different times after aerosol collection. The signals are highly stable in time. The shape and intensity of the signals registered immediately after collection, after a day, and after a week are identical. They were also close in shape and intensity to aerosol signals registered 7 years before. Each of the three types of signals are interpreted. In the narrow signal the value of the g-factor and the small signal width are caused by organic paramagnetic compounds. The closeness of the g-factor to the g-factor of a free electron indicates that the unpaired electron is localized in a system containing carbon. This signal may be related to unpaired electrons trapped by polynuclear aromatic hydrocarbons (PAH). The atmospheric PAH content is an important pollution index because many of these hydrocarbons have mutagenic and carcinogenic effects. The wide signal is evidently associated with  $Fe^{3+}$  ions. It can be postulated that the EPR signal is caused by iron oxides. However, due to the great width of the lines and the presence of antiferromagnetic properties the measurement of the  $Fe^{3+}$  concentration from EPR spectra is difficult. The six-component spectrum can be identified with certainty with  $Mn^{2+}$  ions. These ions are present in the form of an impurity in the lattice of the natural mineral dolomite, which is used in various technological processes resulting in aerosol formation. Figure 1; references 9: 6 Russian, 3 Western.

5303

**Photoelectric Transducer for Analysis of Cloud Layer Aerosols in Venusian Atmosphere**

1841319a Moscow KOLLOIDNY ZHURNAL in Russian Vol 50 No 2, Mar-Apr 88 (manuscript received 11 Nov 86) pp 252-260

[Article by Yu.V. Zhulanov, Physicochemical Scientific Research Institute imeni L.Ya. Karpov, Moscow]

[Abstract] Aerosol component research is important in any study of the formation and evolution of the Venusian atmosphere because it plays a significant role in determining its optical and thermoradiation properties. Data on the sizes and concentrations of particles are needed to clarify the mechanisms of formation and transformation of the disperse phase, particularly in the altitude range 63 to 47 km. The Vega program provided for aerosol research in the Venusian cloud layer by measurements on the Vega-1 and Vega-2 descent vehicles and determination of the vertical profile of concentrations in this altitude range. Aerosols were analyzed by the photoelectric method, by which it is easy to ensure transformation of the measured parameter (particle size) into an electric signal convenient for subsequent processing and transmission to the Earth. This article describes the photoelectric transducer used for this purpose on the two Vega vehicles. Mounted outside the thermostatted volume of the descent module, it could operate at an ambient temperature up to plus 100°C, corresponding to about 47 km. The photoelectric aerosol counter measured 350 x 150 x 100 mm and consisted of two main modules: an optical sensor with an aerosol pumping system and an analysis module. The optical sensor is for registering individual aerosol particles when they pass through the sensing volume and converting the particle size into a signal (the optical system is illustrated and described in detail, with full information also being given on the design and functioning of the analysis module). Development of the system for intake of the sample and formation of the sensing volume involved a great number of considerations. The methods used to address these considerations are discussed. This instrumentation made it possible to retrieve the true aerosol concentration profile during the Vega experiments conducted on 11 and 15 June 1985. Figures 2; references 9: 4 Russian, 5 Western.

05303

**Use of "Model Fan Filter" To Determine Parameters of Highly Dispersed Aerosols**

18410319b Moscow KOLLOIDNY ZHURNAL in Russian Vol 50 No 2, Mar-Apr 88 (manuscript received 6 Mar 86) pp 281-286

[Article by G.N. Lipatov, A.S. Skaptsov, and Ye.A. Chernova, Odessa University]

[Abstract] The diffusion method is used extensively in determining the parameters of highly dispersed aerosols. The model devices first used in trapping these aerosols

had considerable shortcomings, resulting in uncertain interpretation of the results. A solution to the problem was the use of a fibrous aerosol filter, the "model fan filter" proposed by A.A. Kirsch, et al. This filter is a layer of parallel cylindrical fibers whose axes in adjacent rows are displaced relative to one another by arbitrary, non-zero angles. The precipitation of particles in this filter is due to diffusion, direct trapping, inertia, and the operation of electrical forces. An analysis was made of the curves of passage of an aerosol with a log-normal particle-sized distribution through such a filter. Interpolation formulas were derived that make it possible to determine particle size in the range  $10$  to  $1,000 \times 10^{-10}$  m. Methods of processing "model fan filter" data to find the standard geometrical deviation are outlined. Figures 3; references 17: 8 Russian, 9 Western.

05303

#### Dielectric Properties of Charged Aerosol Formations

*18410319c Moscow KOLLOIDNYY ZHURNAL in Russian Vol 50 No 2, Mar-Apr 88 (manuscript received 5 Feb 86) pp 307-312*

[Article by A.Ya. Simonov, Physicochemical Scientific Research Institute imeni L.Ya. Karpov, Moscow]

[Abstract] Aerosol dielectric particles only scatter electromagnetic radiation very slightly, but the scattering of radiation by charged aerosol formations may be several orders of magnitude greater. There have been theoretical but no experimental studies of this phenomenon. A special generator of charged aerosol formations was devised for their laboratory study. The reactor is fabricated in the form of a glass sphere, which makes it possible to observe the process of aerosol formation and coagulation visually. The reactor includes inlets for reagents and electrodes and for removal of samples. Upon entering the reactor, the working substances are mixed, and their chemical interaction occurs with the formation of a final product in the form of an aerosol mixture. This yields a charged NH<sub>4</sub>Cl aerosol consisting of different components (volatile amines plus hydrogen chloride). As an example, a table gives the results of permeability measurements of a charged aerosol mixture based on NH<sub>4</sub>Cl. However, such laboratory studies cannot fully characterize the influence of charge on electromagnetic field-charged particle interaction. Measurements were therefore made in the free atmosphere where it is possible to measure the cloud scattering cross section directly (also using NH<sub>4</sub>Cl as the aerosol). The aerosol cloud generator used consisted of two cylinders filled with HCl and ammonia. The dielectric properties of the charged aerosol cloud were studied by measuring the effective scattering surface of the cloud in the microwave range. The results suggest that the resonance scattering of waves by charged particles exerts a substantial

effect on the process of their interaction with electromagnetic radiation. Both laboratory and in situ research indicates that the phenomenon of dipole plasma resonance of excess electrons on the particle surface makes an important contribution to the process under study. Figure 1; references: 2 Russian.

05303

#### Determining Ice-Forming Activity of Amorphous and Crystalline Silver Particles

*18410319d Moscow KOLLOIDNYY ZHURNAL in Russian Vol 50 No 2, Mar-Apr 88 (manuscript received 21 Jan 86) pp 339-342*

[Article by A.V. Bubnov, B.Z. Gorbunov, N.A. Kakushkina, S.E. Pashchenko, L.S. Lazareva, A.A. Onishchuk, A.E. Pashchenko, A.I. Sidorov, N.A. Silin, and S.B. Khvan, Chemical Kinetics and Combustion Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk; Applied Chemistry Scientific Research Institute, Novosibirsk; Novosibirsk University]

[Abstract] Silver iodide is the best ice-forming reagent. There is evidence that a small degradation of the AgI surface by UV irradiation increases ice-forming activity. AgI degradation results in the appearance of sectors enriched with metal atoms, which suggests that sectors consisting largely of silver have a high ice-forming activity. Research was carried out at the Chemical Kinetics and Combustion Institute for checking this phenomenon. A method was developed for producing metallic silver aerosols with a quite high particle concentration that made it possible to study the ice-forming properties of Ag aerosols. This article contains ice-forming activity data collected in this research. The apparatus used was described in detail by A. M. Baklanov, et al. in IZV. SO AN SSSR: SER. KHIM., Vyp 4, No 9, 1976; the various components of the apparatus and the method are concisely reviewed in this article. The properties of the particles (form and size of particles, crystalline structure, surface purity) were investigated by using electron microphotographs obtained in the spark generator and with the annealing of particles at a high temperature. A table presents data on the ice-forming activity of Ag and AgI, such as the number of ice crystals that can be produced by the injection of 1 g of aerosol particles into a supercooled fog. For example, the Ag particles produced in the spark generator, with a mean radius from 5.5 to 8 nm, produce from  $4 \times 10^{18}$  to  $3 \times 10^{19}$  ice crystals per 1 kg of silver at 263 K. It was demonstrated that crystalline (annealed) Ag forms ice crystals as amorphous Ag does. Although the results are not of practical value since Ag is in such short supply, they are useful in simulating heterogeneous ice formation. The reason for the high ice-forming activity of Ag aerosols is unclear. It is probably attributable to the surface atomic structure of the particles. Figures 3; references 11: 9 Russian, 2 Western.

05303

**Synthesis of 8-Aryldihydroxy Codeinones and Morphinones, Catalyzed by Palladium Complexes**  
*18410193 Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 298, No 1, Jan 88 (manuscript received 30 Apr 87) pp 119-122*

[Article by V.N. Kalinin, S.A. Kazantseva, P.V. Petrovskiy, N.I. Kobelkova, A.V. Polyakov, A.I. Yanovskiy, and Yu.T. Struchkov, presented by Academician V.V. Korschak 30 Mar 87]

[Abstract] Arylation of olefins catalyzed with palladium salts is a general method for forming the C-C bond. Arylation of allyl alcohols results in 2-aryl substituted ketones as a rule. This reaction has been used widely for the synthesis of acyclic arylketones, but only a few examples are known in the alicyclic series. In morphine alkaloids (codeine and morphine) the C ring is tetrasubstituted with cyclohexene-2-ol in an alpha-configuration of the OH groups. The pharmacological properties of this class of alkaloids depend markedly on the nature of the substituent in the 7 and 8 positions. A number of 8-substituted dihydroxy codeinones have been prepared by a reaction of codeine with R<sub>2</sub>CuLi. It has since been observed that under the conditions of palladium catalysis, codeine and morphine react with iodoaryl compounds to give 8-aryldihydroxy codeinones and morphinones, respectively. This reaction is the first example of applying functionalization of morphine alkaloids catalyzed with a palladium complex. Arylation of allyl alcohols is normally carried out in the presence of PdCl<sub>2</sub> in dimethylformamide (method A) or Pd(OAc)<sub>2</sub> in acetonitrile (method B). Both methods were used, although better results were obtained with method B. Arylation of morphine and codeine is a general reaction yielding iodoanisole isomers. The structures of the products were confirmed with IR-, PMR-, and mass spectra. Figures 1; references: 11 Western.

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UDC 542.91:547.943:615.783.1

**Synthesis of Dihydromorphinones from Dihydrocodeinones**

*18410276a Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 2, Feb 88 (manuscript received 29 Jun 87) pp 488-489*

[Article by V.N. Kalinin, N.I. Kobelkova, and D.Ye. Bodrov, Institute of Elemental Organic Compounds imeni A.N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] O-demethylation of morphine alkaloids is an important reaction for the preparation of opiate agonists and antagonists. BBr<sub>3</sub>, pyridine hydrochloride, and alkali metal mercaptides are used for this purpose. It has been demonstrated that the system aluminum trihalide-alkyl sulfide is an effective O-dealkylating agent for arylmethyl ethers, and it has also been demonstrated that morphines containing a ketone function in the C ring may be readily prepared from corresponding codeine derivatives by O-demethylation with the AlCl<sub>3</sub>-SMe<sub>2</sub> complex in methylene chloride at 20 degrees C. This method can also be used for O-demethylation of dihydrocodeines, 14-hydroxydihydrocodeines, and their N-(cyclopropylmethyl) derivatives. In the present work, 14-hydroxydihydromorphine and naltrexone were prepared. 8β-phenyldihydromorphine was prepared from 8β-phenyldihydrocodeine. If aluminum trichloride or tribromide is used without a sulfide, low yields are obtained due to the lability of the oxygen bridge in the morphine alkaloids. References 10 (Russian).

12765

**Use of Laser Gas Analyzer for Operational Control of Work of Adsorber**

18410297a Kiev KHIMICHESKAYA TEKHNOLOGIYA in Russian No 2, Mar-Apr 88 (manuscript received 15 Apr 86) pp 59-61

[Article by N.G. Golubeva, A.N. Ilchenko, O.D. Metelkin, and A.A. Redchuk, Kiev University]

[Abstract] The feasibility of using gas analysis to perform operational control of the effectiveness of adsorber operation and to automate the process of switching adsorbers from a regeneration regime to an adsorption regime was demonstrated. Spectrometric studies produced absorption spectra of saturated vapors of solvents in a wide spectral range and revealed that the spectral position of one of the intense bands almost coincides with one line of generation of an He-Ne laser. This permitted the use of series-produced absorption laser gas analyzers based on inexpensive, reliable, and readily available He-Ne lasers. The LGA type laser gas analyzer used to determine methane concentration in air was used. It proved to be possible to measure concentrations of ethylacetate and butylacetate with a sensitivity of  $10^{-1}$  mg/m<sup>3</sup>, which is greater by a factor of 2 than the sensitivity of the currently used chemical method. The speed of measurements was determined practically by the time of transport of the solvent vapors to the gas analyzer, which takes only minutes. The use of the LGA laser gas analyzer to determine concentrations of ethylacetate and butylacetate increased the accuracy of analysis and reduced the time required for the procedure. Figure 1; references 2: Russian.

02791

**Determining the Dispersion of Substances in Natural Waters by Laser Tyndallemeter**

18410289b Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 10, No 1, Jan-Feb 88 (manuscript received 13 Jan 87) pp 80-82

[Article by V.V. Teselkin, V.M. Kochkodan, L.Ya. Repetyuk, and I.T. Goronovskiy, Institute of Colloid Chemistry and Water Chemistry imeni A.V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the method of laser tyndallemetry and the results of its use to investigate the particle-size distribution of suspensions in river water. As the laser beam passes through dispersed water systems, two spatial zones can be distinguished. The first zone is passed without scattering. The light flux transmitted is practically independent of particle size since it propagates through the medium according to the laws of geometric optics, being reflected and refracted. In this zone the light flux converges to the focal point of all the parallel unscattered rays passing through the suspension. In the next zone, the monochromatic light is intensively scattered. The scattered beams converge in the vicinity of the focal point, forming an aureole of light. The

relative angular distribution of the light flux in this area depends primarily on the particle size. Analysis of the transmission and scattering of light in a suspension thus allows one to determine the concentration and dimensions of particles in heterogeneous media. A type LG-36 He-Ne laser radiating at  $\lambda = 632.8$  nm with a main mode power of 40 mW was used, with scattering recorded by a photoresistor. The method was used to record the solids content of three Soviet rivers, noting significant differences in particle-size distribution. References 9: 8 Russian, 1 Western.

6508

**Use of High-Performance Liquid Chromatography in Chemical-Toxicological Analysis of Pharmaceutical Compounds**

18410301a Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 43 No 1, Jan 88 (manuscript received 20 Oct 86) pp 5-19

[Article by S.K. Yeremin and B.N. Izotov, First Moscow Medical Institute]

[Abstract] Chemical-toxicological analysis is used in determining the nature and concentration of various toxic reagents with different degrees of stability, reactivity, toxicity, etc. A number of methods are used for this purpose. High-performance liquid chromatography is one of the best. This review covers characteristics of chemical-toxicological analysis (general goals, sample preparation, removal of proteins, lipids, and interfering substances); isolation methods; use of high-performance liquid chromatography in chemical-toxicological analysis (advantages, reverse-phase high-performance liquid chromatography, ion-pair high-performance liquid chromatography); comparative samples; metrological characteristics; and interpretation of results. High-performance liquid chromatography makes it possible to overcome many technical difficulties in sample preparation, separation, and identification of multicomponent mixtures, etc. References 246: 16 Russian, 230 Western.

7813

**Interactive Data Processing System for Photoplate-Recorded Spectra**

18410301b Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 43 No 2, Feb 88 (manuscript received 17 Nov 86) pp 224-238

[Article by G.I. Ramendik, A.Yu. Khromov, D.M. Ramendik, G.I. Chernoglaanova, and S.I. Gronskaya, Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy, USSR Academy of Sciences, Moscow; Moscow State University imeni M.V. Lomonosov]

[Abstract] This work analyzes general principles of an automatic processing of spectra recorded on photographic plates along with its practical application in a

"man-machine" system. The program was written for mass spectrometric application. Software for atomic emission analysis was also developed. Four stages were identified in reaching this goal: 1) utilization of semiautomatic attachments to series-produced non-automatic microphotometers in which the operator performs quantitative spectrum analysis; 2) fully automated equipment that requires large computers; 3) primary data processing systems, and 4) final data processing, which is done in an interactive mode. The paper then covers principles of automated spectrum processing, parameters of automated spectrum measuring units, algorithms for primary and secondary processing of mass spectra, equipment block diagrams, and reproducibility of data at the primary processing stage. This system makes it possible to exclude routine processes, shortens processing time, and improves reproducibility. Figures 3; references 40: 18 Russian, 22 Western (2 by Russian authors).

7813

### **Flow Injection System for Catalytic Spectrophotometric Determination of Manganese in Sea Water**

18410301c Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 43 No 2, Feb 88 (manuscript received 24 Oct 86) pp 284-288

[Article by I.Ya. Kolotyrkina, L.K. Shpigun, and Yu.A. Zolotov, Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy, USSR Academy of Sciences, Moscow]

[Abstract] Manganese is one of the main indicator elements used in searching for signs of hydrothermal activity at the sea bottom. Because of its low content in sea water (0.05 mg/ml), special methods must be used to detect it. Some are based on its catalytic action in periodate oxidation reactions. The goal of this study was to develop a flow injection system for continuous determination of manganese in sea water based on the catalytic oxidation of N,N'-diethyl aniline with potassium periodate to N,N,N',N'-tetramethyl benzidine, coupled with spectrophotometric detection of the yellow product at 475 nm. One crucial step in the method is proper sampling to allow adequate reaction time for the color to develop. The system was field-tested in the Atlantic Ocean at a depth of 5,000 m, which showed that it could be used under conditions of seafaring expeditions. Under expedition conditions, the flow injection system can detect between 0.02 and 1.0 ng/ml manganese in sea water. The relative standard deviation at a manganese content between 0.1 and 0.4 ng/ml is 0.19 and 0.05, respectively. Figures 4; references 11: 3 Russian, 8 Western.

7813

### **Using Holographic Interferometry to Study Mass Transfer in Cellulose Ester Refining**

18410186a Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 11, Nov 87 (manuscript received 6 Feb 85) pp 2478-2483

[Article by N.B. Sosnovskaya, L.P. Klinova, O.T. Shipina, and G.N. Marchenko]

[Abstract] The majority of engineering processes used to produce cellulose and its products are based on the preliminary treatment of cellulose or its esters with some solvent, followed by the removal of the latter. Solvent removal is thus a very important step in forming the properties of the end product, and detailed examination of mass transfer between the small-sized porous particles and the liquid phase used to wash these particles is required. The relationship between the mass output coefficient and various conditions and design parameters must be determined so as to solve the problems entailed in determining concentration fields within and on the particles' surfaces. Details on the mechanism of turbulent exchange inside the diffusion boundary zone are needed to formulate this relationship. Current mass transfer theory is ambiguous in this respect, whereas the experimental solution of similar problems is difficult due to the fact that the conditions actually used in product refining include both laminar and turbulent states. In the latter case, moreover, the resultant diffusion boundary layer on the particles being studied has a thickness measuring only a few tens of microns. Experimental study thus becomes difficult. Apparently, a non-contact or optical method, such as holographic interferometry, may be used to study this diffusion layer. This method has all the advantages of laser interferometry (contact-free, high resolution, and high information yield), and where classical interferometry is capable of spatial separation of a light beam only, in holographic interferometry, the amplitude of a light wave becomes spread out as a function of time. This means that the light waves used to form the interferogram follow the same path through space, but at different moments in time. Interference of these waves results in total compensation of all uncontrollable optical nonuniformities, whose elimination in conventional interferometry is very difficult. If some object is placed before a light beam during a second exposure, the interferogram will show the change in wave front caused by the object. The capability of eliminating distortion due to changes in length of the optical path not related to changes in the object is an important property of holographic interferometry. A double-beam holographic interferometer was constructed in which a cross section of the experimental compartment is optically joined to the recording plane of the interferogram. The latter makes it possible to form an optical image of the object (a particle) on the hologram and exclude the effects of light diffraction during the formative stages of the wave front, thus giving sharp surface contours. Recently, holographic interferometry was used to analyze the diffusion boundary layer on solid particles placed in a turbulent stream. In the present

work, this method was used to study the diffusion boundary layer formed on nitrocellulose spherules 1 to 2 mm in diameter with 10 to 15 percent porosity that were presaturated with ethanol. From the data collected, it was possible to discern the flow and time features of the process from which design parameters could be determined to build mixing equipment. The data on the structure of the diffusion boundary layer in the system nitrocellulose-solvent-water, as obtained by holographic interferometry, may be considered to be highly informative for the study of other phenomena, particularly the multiphase nature of esterification and the specific conditions used in the refining of cellulose esters and their end products, where mass exchange and mass transfer are frequently determined on the basis of available operating conditions. Figures 5; references 9: 7 Russian, 2 Western.

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#### Analytical Chemistry of Industrial Waste Effluents: Features, Problems, and Main Developmental Trends

18410239a Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 42, No 12, Dec 87 (manuscript received 24 Mar 87) pp 2117-2127

[Article by Yu.M. Dedkov, State Scientific and Technical Project and Design Institute for Alloys and Treatment of Nonferrous Metals, Moscow]

[Abstract] Modern technology has brought about a marked rise in water needs by industry and agriculture throughout the world. In the Soviet Union, industrial water usage, including that for heating purposes, rose from 28.0 cubic kilometers per year in 1960 to 93.4 in 1980. Limited freshwater reserves thus make freshwater an important resource of any nation. In addition to quantitative losses of water, a qualitative degradation has also been observed, with notable quantities of iron, phosphorus, oil, lead, and detergents dumped into the oceans each year. It is estimated that by the year 2000, most of the population of this planet will be using recycled waste water for drinking purposes, and therefore a noticeable increase in expenditures for environmental protection has been observed throughout most of the world to where treatment and supply of water has become a major branch of industry. The present review emphasizes trace analysis of multicomponent samples. The diversity of water needs and complexity of samples have made it necessary to develop generalized water purity standards. An optimal outline for water analysis based on several generalized standards (dissolved organic carbon, total nitrogen, oxidizability, biotests, etc.) and determination of most leading pollutants is presented. Some of the problems and trends in the development of the analytical chemistry of water are discussed. References 39: 15 Russian, 24 Western.

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#### Spectroscopic Methods for Analysis of Natural and Wastewaters

18410239b Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 42, No 12, Dec 87 (manuscript received 4 Feb 86) pp 2151-2162

[Article by M.V. Akhmanova, N.S. Safronova, Ye.N. Savinova, and A.Kh. Galuzinskaya, Institute of Geochemistry and Analytical Chemistry imeni V.I. Vernadskiy USSR Academy of Sciences, Moscow]

[Abstract] Industrial effluents are a primary danger to rivers and lakes, and while the variety of pollutants is large, they consist mainly of oil products, heavy metals, cyanides, and sulfur compounds. Currently, maximum allowable concentrations [PDK] have been established in the USSR for 960 compounds and elements. The many methods developed to monitor pollutant content must take into account existing classification systems for both natural and wastewaters. Remote-controlled determination of pollution in fresh and sea waters, using optical spectroscopy and lasers, appears interesting. Conventional direct contact analysis makes it possible to evaluate metrological characteristics and to study dissociation and complex formation and their effects on the analytical signal. Waste effluents are normally combined with natural waters or diluted by them, and therefore, in developing any method of analysis, the introduced pollutant is studied against a background of naturally occurring admixtures. For example, monitored organic compounds are determined against a background of the decomposition products of animal and plant residues present in surface waters. It is thus necessary to conduct a joint analysis of "pure" natural water with effluents. The purpose of the present work was to enlist a set of spectroscopic methods (UV- and IR-spectroscopy, spectroscopy in the visible range and Raman spectra, luminescence with laser excitation, and atomic emission spectroscopy) and to examine the effectiveness of such an approach. It has been recommended that the results be used to uncover possible discrepancies in remote laser probing of waters. A method was developed to determine the total content of organic matter in water, using laser fluorescence with a supporting Raman signal for water, which yields a gain of one and a half to two orders compared with UV-spectrophotometry. It has been demonstrated that simultaneous control of inorganic contaminants must also be conducted in order to check their effect on fluorescence intensity, and atomic emission spectroscopy methods have been proposed for this. Contaminants of an organic nature are identified with IR-spectroscopy, employing data deposited in the information retrieval system. Figures 5; references 23 (Russian).

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**Assessment of Level of Development and Trends  
in Thin Layer Chromatography Based on Analysis  
of Publications and Patents**

18410239c Moscow ZHURNAL ANALITICHESKOY  
Khimii in Russian Vol 42, No 12, Dec 87 (manuscript  
received 17 Apr 86) pp 2251-2264

[Article by M.P. Volynets, T.G. Gayvoronskaya, T.V.  
Dubrova, and A.V. Dombrovskaya, Institute of Geoche-  
mistry and Analytical Chemistry imeni V.I. Vernadskiy,  
USSR Academy of Sciences, Moscow]

[Abstract] Thin layer chromatography is widely used in organic and inorganic analysis, and for this reason, many articles and patents have been published and are continuing to be published in this field. The present article is a review based on 2,800 patents and over 200 articles dating from 1973 to 1984. From this, 76 patents and

over 100 articles on sorbents, equipment, and devices and techniques for qualitative and quantitative analysis were selected to assess the technological level and developmental trends of thin layer chromatography and to identify the leading countries, organizations, and firms issuing patents in this field. Technological development levels and developmental trends were divided into four categories: 1) sorbents and preparation of the separation layer; 2) apparatus and devices for conducting thin layer chromatography; 3) methodological topics and operating techniques; and 4) apparatus for qualitative and quantitative determination of elements in chromatographic layers. The leading countries are the FRG and USA, with Merck Patent (Gmbh) being the leading firm. References 115: 8 Russian, 107 Western.

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**Violagens with Charged Groups—New Redox-Carriers in Photocatalytic Separation of Hydrogen from Water in Homogeneous and Vesicular Systems**

18410189a Moscow *IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA* in Russian No 11, Nov 87 (manuscript received 21 Jan 86) pp 2458-2463

[Article by V.E. Mayer, A.N. Kitaygorodskiy, N.K. Khannanov, and V.Ya. Shafirovich, Institute of Chemical Physics, Chernogolovka Branch, USSR Academy of Sciences, Chernogolovka]

[Abstract] Methyl viologen ( $MV^{2+}$ ) is a traditional electron carrier in homogeneous systems for photocatalytic separation of hydrogen from water. The capability of the methyl viologen cation-radical to penetrate through a double layer membrane supports its application in organized molecular photocatalytic systems. In the present work, four violagens were synthesized and characterized with data from PMR-spectroscopy, spectrophotometry, and polarography. The redox potential of viologen was demonstrated to have an effect on the hydrogen separation reaction rate constant from water over a platinum catalyst. In contrast to the cation-radical of methyl viologen, a viologen radical with a charged group does not penetrate the wall of a vesicle to an external solution, and by introducing a Pt-catalyst to the internal volume of a vesicle, it will separate hydrogen from water. Figures 2; references 15: 4 Russian, 11 Western.

12765

UDC 541.127:541.135.5:547.96

**Nonstationary Kinetics of Processes in Potentiometric Single-Enzyme Electrodes**

18410340a Moscow *KINETIKA I KATALIZ* in Russian Vol 29, No 2, Mar-Apr 88 (manuscript received 30 Mar 87) pp 344-351

[Article by V.V. Sorochinskiy and B.I. Kurganova, Vitaninny Scientific Production Association, Moscow]

[Abstract] A study is presented of the unsteady kinetics of processes in potentiometric single-enzyme electrodes containing a layer of immobilized enzyme and an outer

membrane with a first- and zero-order enzymatic reaction rate with respect to the substrate. The electrode response time in a dilute substrate solution is found to decrease as the diffusion modulus and ratio of outer membrane thickness to immobilized enzyme layer thickness increase. Electrode response time is independent of enzyme activity when the substrate is saturated, and it increases slightly with increasing membrane-to-enzyme layer thickness ratios. Electrode response time is proportional to the square of the total coating thickness divided by the diffusion coefficient of the substrate and product in the coating. Figures 3, references 6: 3 Russian, 3 Western.

6508

UDC 66.084+541.127

**Influence of Ultrasonic Waves on Course of Oscillating Chemical Reactions**

18410343c Moscow *ZHURNAL FIZICHESKOY KHIMII* in Russian Vol 62, No 4 Apr 88 (manuscript received 7 Apr 87) pp 941-946

[Article by N.A. Maksimenko, V.S. Shipovskov, and M.A. Margulis, Moscow State University imeni M.V. Lomonosov, Department of Chemistry; All-Union Organic Synthesis Scientific Research Institute, Moscow]

[Abstract] Concentration fluctuations in chemical synthesis may significantly influence the operation of industrial reactors. Concentration oscillations in biological media can model certain processes in living cells. One of the best-studied chemical systems is the oxidation of malonic acid by bromate (Belousov-Zhabotinskii reaction). Ultrasonic waves are a powerful factor influencing many chemical reactions. This article studies the influence of acoustic waves on oscillating chemical reactions. It is found that ultrasound decreases the induction time and the oscillation period, changing the oscillation amplitude and time. Ultrasound initiates concentration oscillations with a period of over 24 hours in systems in which concentration oscillations are damped in 59 minutes. An eight-stage mechanism by which ultrasound acts on certain Belousov-Zhabotinskii reaction stages is proposed. Figures 3, references 9: 8 Russian, 1 Western.

6508

**Chemical Industry Ministry and Trade Union Meeting Held**

*18410322a Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Apr 88 p 2*

[Article by L. Sotnik, staff correspondent, datelined Ivano-Frankovsk Oblast: "To Class—To Kalush"]

[Text] An expanded meeting of the USSR Ministry of the Chemical Industry Board and the Presidium of the Central Committee of the Chemical and Petrochemical Industry Workers' Union was held in at the "Khlorvinil" Association in the Carpathian city of Kalush.

Kalush's "Khlorvinil" was not chosen accidentally. By switching to the new management methods, this money-losing association not only improved economic indicators, but may also actually cross the threshold to profitability in the near future. The well planned organization of cost-accounting relations among shops and plants, skillful use of credit, and the reduction in production expenses are helping.

Summarizing the Board meeting, The USSR Minister of the Chemical Industry Yu. Bespalov pointed out the need for a gradual transition from the "first model" of cost-accounting to the "second," which ensures genuine enterprise self-financing and the direct tie-in between labor collective's income and the results of economic activity.

Yu. Borodkin, deputy head of the Chemistry Industry Department of the CPSU Central Committee, and S. Alekseyev, secretary of the Central Committee of the Chemical and Petrochemical Industry Workers' Union, took part in the meeting.

12809/12223

**Chemical Industry Bureaucrats' Response to Perestroyka Satirized**

*18410322c Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 May 88 p 2*

[Article by P. Malykh, engineer, NIIkhimmash [Scientific Research Institute for the Chemical Industry], staff correspondent, datelined Irkutsk, under the rubric "With Satirical Pen:" "Clumsy from Minkhimmash"]

[Text] It has somehow gotten to be the custom to search for skilled craftsmen among workers or nearby. But it never occurred to anyone to look to the ministries or other high institutions for such an item. What could they do, those bureaucrats with their soft hands? But that was a mistake! There are real people in the ministries, too...

The ministry craftsman has spent his whole life contriving clever instructions and has thereby inspired creative ideas from Moscow to the boondocks. Thousands of craftsmen lower in rank have feverishly invented methods to get around the instruction and left thick folders

and thin proposals in ministry offices. But things came to a boil and then boiled over, and suddenly there was a cudgel held over the ace paper-shuffler...But a bureaucrat wouldn't be worth his salt if he would put his head on the chopping block and voluntarily slip out of his cushy chair. No sir! There are still craftsmen among the bureaucratic fraternity!

You come at us with a cudgel, and we will gratefully take it into our hands and look it over: bend it a little here, turn it a little there...And in our hands your cudgel will become a boomerang—the combat weapon of Australian aborigines. No matter how much you throw it—it always comes back...

Let us trace the technology for manufacturing these boomerangs.

On May 18, 1987, the Ministry of Chemical and Petrochemical Machine Building gave birth to "Branch Procedural Instructions on Determining and Applying Labor Input Indicators in Planning Labor." Does this wording resemble something similar, painfully familiar, recent? No, it only seems that way to you. Because the document's beginning is completely the same: "The accomplishment of the course set by the 27th CPSU Congress to intensify production requires rational use of labor resources, a continuous increase in labor productivity." And so forth.

The document glows red-hot with such phrases. Starting with the third paragraph, it recommends beginning to bend the cudgel in the necessary direction. "In this connection, the branch should create a permanent system, controlling the labor content of products. It should be a set of statutes, procedures, and forms, defining and regulating the procedure and organization of work on setting and achieving labor content indicators at stages in production development."

Got it? Even a novice would understand where the bend for labor content will be. But to eliminate doubts, further on we'll give the scheme for the branch's system for extremely labor-consuming control of labor consumption.

So the hand-fashioned boomerang, adorned with the magical symbols of perestroyka, went flying, hitting the head of every adherent of self-support, self-financing, cost-accounting, and other innovations. Supporters at enterprises are now obliged to calculate maximum labor content at the specification stage, and, simply speaking, to count their chickens before they're hatched. However, for this fictional operation, too, procedural instructions provide a whole procedure for determination, consensus, and approval.

Next comes the labor content of design, a more bothersome affair: "To arrive at design labor content at enterprises, a schedule is to be developed to arrive at this labor content, organizational-technical steps are to be taken..." And so forth.

Better luck, supporters! The boomerang is screaming like an aerial bomb. Are necks stretched out at "Prozhektor perestroyki?" You won't dig your way out from under our papers now, and you'll wither away in agreements!

Here is the agreement procedure. Alternative No. 1, please, for starters:

1. The developer organization develops detailed design documentation;
2. The manufacturing enterprise develops the design technology and, with it, calculates design labor content. The results of the calculations are entered into a "design labor content chart;"
3. The lead technical subdivision of the VNPO [All-Union Scientific-Production Association] (NPO [Scientific-Production Association]) checks that the manufacturing efficiency of the product has been correctly evaluated and approves the "design labor content chart;"
4. The lead economic planning subdivision of the VNPO (NPO) checks that the rates set for achieving design labor content correspond and approves the "chart;"
5. The VNPO (NPO) subdivision responsible for increasing the engineering-technological and organizational-economic level of production examines the design labor content and approves the "chart;"
6. The chief engineer of the VNPO (NPO) approves the "design labor content chart;"
7. VNIIPKhimneftemash [All-Union Scientific Research and Design Institute for Chemical and Petrochemical Machine Building Technology] performs a random examination of design labor content and provides overall procedural supervision of work to establish it.

What a throw! What paper-pushing! But the main thing is how the time to develop and put an item into production will grow! Here you can even create at least one more glavka [MA] to produce administrative guidelines.

No, we must rate the bureaucrat's skills on merit. He has already learned a lot during the years of perestroyka. They unleashed the Law on State Enterprises on him, and he responded with state orders, like torpedoes against a cruiser. And the Law has already sprung leaks. They

throw cooperatives at him—he comes back with agreements, direct relations, the progressive tax. He's gotten the hang of knocking down slogans about democracy, without even aiming, with temporary rules based on a decree half a century old.

You understand the clumsy bureaucratic is human, too—everyone wants to live and live well. As long as he is in his chair he will fight for his own beautiful life, he will come up with quite a few surprises.

Somehow we are fighting these crafty guys the wrong way. Perhaps we should simply close many executive offices and pay wages not to top-level spongers, but only to the doers.

12809/12223

**Joint Enterprise of USSR and France**  
*18410299c Moscow KHIMZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 3, Mar 88 pp 34-35*

[Article by V.A. Khorev, USSR Ministry of Mineral Fertilizer Production]

[Abstract] Constituent documents for the first USSR-France joint enterprise "Tekhnikord," which combines production interests of the SNMI firm in Avignon, France, and the GIGKhS [State Scientific Research Institute of Mining and Chemical Raw Materials] of the USSR Ministry of Mineral Fertilizer Production, have been written. The GIGKhS will be the site for production of flexible cords. Production will be based on the wide possibility of using wastes of conversion of apatite-nephelene ores to produce metal spray coating composites with high resistance to wear, corrosion, and heat up to 2000 degrees C, as well as high antifriction properties. The French company will provide some of the equipment and production technology and will supply the "Tekhnikord" cellulose bonding composite. The first large batch of the product will be put on the market in 1989. The production base will be expanded gradually, and production will increase continuously. The mutual advantages of this joint venture were presented and discussed briefly.

02791

**First Results of Operating Rubber Industry Enterprises under New Management Conditions**  
*18410289a Moscow KAUCHUK I REZINA in Russian No 1, Jan 88 pp 2-6*

[Article by S.M. Polotskiy, V.A. Zhelezov, and R.Ye. Dunyushkina]

[Abstract] Among the first five industries in the nation, the enterprises and associations subordinate to the Ministry of the Petrochemical Industry began operating under conditions of complete self-financing as of 1 January 1987. The new conditions were put into full

operation, bypassing the large-scale experimental stage under which tire industry enterprises have been working since 1986. For the first time in domestic industry, the "pure production" characteristic was introduced in planning and evaluating enterprises' economic activity in order to determine labor productivity and generate the wage fund. Analysis of the first results indicate the effectiveness of the new economic mechanism and its great stimulating potential. In comparison with the corresponding period of 1986, the second and third quarters of 1987 showed a 9 percent increase in profit, a 0.92 percent decrease in cost per ruble of production, and a 1.6 percent reduction in material costs, with 48 percent of the increase in product volume achieved by savings of material resources. All of these figures are superior to the similar increases in the same period of the previous year. The new economic mechanism reflects the true state of affairs in the industry as of 1987 more objectively than did the previous management conditions.

6508

#### **Developmental Trends in Production and Use of Paints and Varnishes**

18410293a Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OБSHCHESTVA IM. D.I. MENDELEYEVA in Russian Vol 33, No 1, Jan-Feb 88 pp 4-11

[Article by Doctor of Chemical Sciences V. G. Lambrev, Candidate of Chemical Sciences Ye.P. Bogomolova, and Candidate of Chemical Sciences L.V. Kozlov, State Research and Planning Institute of the Paint and Varnish Industry]

[Abstract] Second only to the United States, the USSR produces over 3 million tons of paints and varnishes each year. Modernization is proceeding apace, led by the development of new technological processes and equipment, the search for new, less expensive sources of raw materials, expansion of areas of applications of paints and varnishes, the solution of ecological problems, and decreases in power cost for production and use of paints and varnishes. Progressive trends include radiation drying, electroprecipitation, curing of coatings with vapor-phase catalysts, coil coating, application of powder paints by electrostatic spraying, and the use of water-soluble paints that are cured by UV radiation. This article primarily discusses these trends in the West, though it is noted that the USSR is now producing epoxy, polyester, and polyvinyl butyral powder paints on an increasing scale and has developed new heat-cured water-soluble film-forming agents for use in paints. Soviet production of rolled metal products painted with a zinc-filled material has been started, and a zinc-filled primer has been developed for use on cold-rolled steel for the manufacture of motor vehicle bodies and parts. References 54: 12 Russian, 42 Western.

6508

#### **Modern Equipment for Producing Paint and Varnish Materials**

18410293b Moscow ZHURNAL VSESOYUZNOGO KHIMICHESKOGO OБSHCHESTVA IM. D.I. MENDELEYEVA in Russian Vol 33, No 1, Jan-Feb 88 pp 80-88

[Article by Candidates of Technical Sciences V.Ye. Sorokin, A.M. Pekler, and A.M. Kashnikov, State Research and Planning Institute of the Paint and Varnish Industry]

[Abstract] The equipment presently used for the synthesis of film-forming materials consists primarily of large-capacity batch equipment (up to 80 m<sup>3</sup>). The near future will see nongradient isothermal batch reactors similar in flow structure to full mixing equipment. Organization of internal and external circulation loops will combine ideal mixing and extraction zones. The creation of active hydrodynamic conditions is particularly important for future large-capacity reactors to avoid stagnant zones and bypass flow. Conditions must be developed to ensure intensive mass transfer and heat exchange using external circulating loops with induction heaters, film-type heat and mass transfer equipment, and systems to trap and return nonvolatile reaction mixture components. Another promising trend is the use of organic bases as catalysts. Following synthesis, more effective means of separation and purification are needed such as separation of alkaline mother liquor, acidification, and washing rather than the existing settling, filtration, and azeotropic drying in the production of epoxy resins. Metal-based filters with constant partial back-flow for continuous regeneration have also been developed. For the production of pigmented materials, a new type of dispersing unit has been developed that combines high dispersion speed with low mixing speed, which allows dispersion of high viscosity materials. A number of inventions have been patented using electromagnetic equipment for dispersion that are based on the energy of motion of large numbers of magnetic elements under the influence of an alternating magnetic field. Also interesting is dispersion of materials during extrusion under high pressures through microscopic gaps. Figures 4, references 61: 45 Russian, 16 Western.

6508

#### **Automatic Monitoring of Chemical Technology Processes Based on Response Function**

18410294a Moscow KHIMICHESKAYA PROMYSHLENOST in Russian No 1, Jan 88 pp 48-50

[Article by I.I. Zaslavskiy, L.V. Kamenev, and Yu.P. Yeliseyev]

[Abstract] The use of computers and microprocessors in chemical process control systems has allowed a basic transition to be made in the techniques used to monitor

the composition of a reaction mixture. Instead of periodically taking samples for laboratory analysis to determine when a process has been completed, it is now possible to analyze the change in the response of the reaction mixture to an external input over time. More important than accurate knowledge of the actual composition of the mixture is analysis over time of the change in this response function, which shows a characteristic qualitative alteration in many typical processes upon completion of the reaction. Examples are noted of chemical technology processes in which this method of automatic composition monitoring can be used. In these processes, impulse dosing of reagents into the chemical reactor in combination with automatic analysis of the time characteristics of the response function using microprocessors creates the prerequisites for monitoring the composition of the reaction mixtures and controlling the chemical processes by using nonselective sensors presently available. Figures 3, references 9: Russian.

6508

#### **Developments at Moscow Institute of Chemical Machine Building for Various Branches of Industry**

*18410294d Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2, Feb 88 pp 40-41*

[Article by engineer L.G. Shadrin]

[Abstract] In the spring of 1987, the Moscow Institute of Chemical Machine Building opened an exhibit of institute products. The achievements of 30 of the institute's departments and its scientific research laboratories in the following areas were exhibited: equipment for separation of multiphase products, column apparatus, reactors, dryers, monitoring instruments and devices, robotic equipment, compressors and pumps, and measuring equipment. The exhibit featured the first operating installations, devices, models, monographs, and CAD application programs. Most of the developments are protected by authors certificates and patents. Many have been introduced into industry or have passed pilot-scale testing and have been recommended for introduction. This article discusses the pumps and compressors and measuring equipment exhibited.

6508

#### **Soviet and Czechoslovakian Chemists Organize Cooperation**

*18410305c Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 May 88 p 3*

[Article by Ye. Valov, Tula: "Handshake of Chemists"]

[Text] The Shchokino Production Association Khimvolokno has established friendly contacts with personnel of the Povazska Chemical Plants in the Middle Slovak

Region of the Czechoslovakian SSR. The specialists of the related enterprises agreed on joint development of a technology for using polyamide wastes.

The Khimvolokno Association has accumulated much experience in the use of waste-free technology. In particular, a regeneration shop is in operation where polymer wastes are transformed into high-quality raw material for the production of cord fabric. This process is ecologically clean.

5303

#### **Management Blocks Initiative of Innovative Workers**

*18410305b SOTSIALISTICHESKAYA INDUSTRIYA in Russian 4 May 88 p 2*

[Article by V. Pryadko, Dneprodzerzhinsk: "This Couldn't Happen in Japan!" first three paragraphs, SOTSIALISTICHESKAYA INDUSTRIYA introduction]

[Text] I. Barabash, the director of the Dneprodzerzhinsk Affiliate of the State Institute for the Nitrogen Industry and Organic Synthesis Products (GIAP) was adamant:

"As a scientist, for many years he developed nothing. In any case, his work yielded no economic effect!"

"No effect? Untrue!" retorted M. Bodnev, secretary of the Party bureau. "The Kryzhenko group was able to develop diffusion elements that are backed up by several Author's Certificates. It is not the group's fault that for the time being they have not come into broad use."

The "hero" in this clash of opinions is senior scientific specialist A. Kryzhenko, who meanwhile has tried to insist that his group has the right...to work on.

Fifteen years ago three enthusiasts, A. Kryzhenko, A. Gulak, and Ye. Serdyuk, began to develop diffusion or, as they are still called, membrane elements. They should become one of the links in the technology for producing ultrapure hydrogen, in whose development scientists of the Electric Welding Institute imeni Ye.O. Paton, the Ural Polytechnic Institute, and the GIAP participated.

The efforts of the innovators were not in vain. Their flat-welded diffusion elements, made from foil, were used in the annealing of transformer steel and helped to reduce the losses in magnetic reversal by a whole 3 percent! But then it was found that these elements make it possible to obtain hydrogen in which the quantity of impurities is ten-millionths of a percent. "A gadget!" objected the sceptics. "This could not be done even in Japan!" But a year and a half of testing of the diffusion element developed by the pressurization method at the affiliate revealed that in this case the Japanese were behind.

This success provided a weighty basis for the broad industrial introduction of the innovation. As early as November 1983, a technical conference in which representatives of the GIAP, the Leningrad Scientific Research Institute of Chemical Machines, and the Dneprozerzhinsk Affiliate participated concluded that it was necessary to organize specialized production of industrial diffusion apparatus and equipment. The importance of the problem was recognized by the State Committee on Science and Technology, who incorporated it in the all-union program. The All-Union "Soyuzazot" Association was the client. The Dneprozerzhinsk workers also should render technical assistance to the "Uralkhimmash" Production Association in "debugging" the industrial technology for the fabrication of the innovation and continue research on improving the entire process.

It would seem that after such recognition the scientists should receive the broadest support, particularly from the directors of the affiliate. Especially since a coordination plan was soon drawn up on the problem of diffusional purification of hydrogen. This was signed by the directors of the specialized organizations of nine branches, including I. Barabash. But, as it became clear, the affiliate director's signature did not mean that he intended to change his attitudes toward the group of enthusiasts.

As if to heat up the conflict, the affiliate director and his deputy for scientific work Yu. Kartsovnik for months kicked the official notes of A. Kryzhenko back and forth between each other, making him nervous and forcing him to write new reports. When this became boring, a new way to procrastinate was devised, wrangling with the central institute: who should be in charge of the diffusional purification of hydrogen. Barabash issued an ultimatum: "Either hand the entire program to me, or take it over. I don't want it half one way and half the other!"

The wrangling went on for a long time. From time to time memoranda flew to Moscow and back. Seven letters arrived at the affiliate from the central institute in which I. Barabash was ordered to enlarge the Kryzhenko group to 6-7 persons. But Ivan Ivanovich did not even dignify some of them with an answer. And the central institute was involved! Barabash did not intend to implement even the direct orders of "Soyuzazot" directors.

When A. Kryzhenko turned for assistance to the republic's Committee for National Control, the commission established for checking this out noted: "...despite the repeated instructions of Comrade Kizil, the GIAP director, that conditions be provided and that the group be strengthened for perfecting membrane apparatus and modular units for producing especially pure hydrogen, the affiliate managers are impeding the expansion of this work." But even after the commission spoke there was no change.

In striving to hinder A. Kryzhenko and his comrades the affiliate director was ready for everything. For example, when the group concluded an agreement with "Uralkhimmash" where a sector is being established for the fabrication of diffusion elements, two specialists were assigned to it who did nothing and only drew their pay. But after some time Lipetsk metallurgists turned up with a proposal that an agreement be concluded with the Kryzhenko group. But Barabash and Kartsovnik took a firm stand: no such agreement could be concluded since all personnel were involved in work for Uralkhimmash.

Now there is no longer talk of assistance. For the moment, Kryzhenko is just praying that he not be hindered. But as soon as the group began to be engaged in the development of diffusion elements of a new type, the affiliate managers ordered that the group be moved to other quarters, assigning it one room, not three.... However much Kryzhenko asked that the equipment not be dismantled during his absence (he was sent out on assignment) they paid him no heed. On the contrary, as if by spite, all the equipment was removed, and everything was lumped together.

I will not take it upon myself to judge the contribution of the affiliate director to scientific and technical progress. But in another field he has clearly excelled. His calculation that many would grow weary of the exhausting conflict proved to be justified. And that it would be easy to break them. For example, he prepared a letter in the name of the director of the GIAP, dismissing responsibility of the institute for work under this program. And I. Kisil, prior to this furious, capitulated and signed it.

Is there need for saying how this conflict was perceived among the workers? Many see in this an object lesson that restructuring has not changed the distribution of forces. As I. Barabash has considered the affiliate to be his private domain, so he continues to maintain this position. And no one is hurrying to straighten him out.

Now I. Barabash is free to act. Everywhere possible he continues to assert that the Kryzhenko group is not a creative team, but only a workshop for the fabrication of diffusion elements. And it does not fit into the scientific program. Nothing in which it is engaged is called for in the affiliate plans. And recently an effort was made to discipline the director of the group himself, evidently for his stubbornness. No, in Japan this could not happen!

In place of a footnote: at the Leipzig Fair, which was held recently, an apparatus with diffusion elements for the production of ultrapure hydrogen was awarded a Gold Medal.

**Phosphorus Industry Responds to Critical Comments**  
*18410305d Moscow SELSKAYA ZHIZN in Russian  
13 Mar 88 p 2*

[Unsigned: "Expenditures...Because of the Environment;" first paragraph SELSKAYA ZHIZN introduction]

[Text] "Expenditures...Because of the Environment." Such was the title of an article published on 23 October 1987. It told of the poor use of the wastes of enterprises producing phosphorus and phosphorus fertilizers.

The Soyuzfosfor All-Union Phosphorus Industry Association in its letter to the editors reports that the facts mentioned in the article are true. However, at the present time, on the basis of an analysis of the sources of formation and composition of secondary material resources, goals have been formulated in the phosphorus industry for their utilization in the fabrication of valuable products; these involve broadening and, accordingly, reconstruction of existing facilities and construction of new facilities for the preparation and reworking of production wastes.

In accordance with the planned program for the renovation and retooling of phosphorus industry enterprises, during the 13th Five-Year Plan there will be construction, at existing work sites, of new shops for the production of yellow sulfur. They will be equipped with modern waste-free technologies and equipment. The plans for the reconstruction of "Soyuzfosfor" enterprises will provide for the utilization of furnace gases, at the present time being the main environmental pollutants, as well as the reprocessing of phosphoric slags into construction materials.

With the start-up of factories to produce sintered briquettes in 1988, by the end of the 13th Five-Year Plan the task of supplying phosphorus plants with technologically suitable raw material will be ensured, and raw material losses during production will be completely precluded.

For the purpose of partially reworking the slags produced by phosphorus plants that are accumulated in waste heaps, it has been decided that a shop will be constructed at the Chimkent Fosfor Production Association. It will produce slag blocks for public consumption at a capacity of 20 million units annually.

In order to improve the status of matters with respect to environmental protection, at all Soyuzfosfor enterprises specialized shops and sectors have been established to repair and service dust and gas purification equipment as well as environmental protection sections. The wages of workers in these subdivisions will be based on the final result: a reduction of the volumes of harmful effluents and wastes.

When the second stage of the runoff-free system at the Chimkent Fosfor Production Association is put into operation, all the enterprises of the association will operate without dumping into river basins. Fluid and pastelike production wastes containing harmful substances will already be fully reworked to mineral fertilizers at all association enterprises during the 12th Five-Year Plan. The construction of these shops was included in the plan for 1987-1990 and was backed up by funding. By 1995 all wastes and secondary material resources will be fully brought into the production cycle.

This response was signed by T.M. Alzhanov, head of the All-Union Phosphorus Industry Association.

The Kazakh Phosphorus Industry Scientific Research and Planning Institute also responded to the article. A letter over the signature of L.M. Volozhin, institute director, states that the subject dealt with in the newspaper is timely. The constantly increasing volume of construction in Kazakhstan has made it necessary to seek new raw material for the construction materials branch. One of these sources, in the southern regions of the republic, is the slag of electrothermal production of yellow phosphorus, whose yield is 10 to 12 tons per ton of phosphorus.

With respect to chemical composition, the slags from this production resemble blast furnace slags, differing from the latter in their fluorine and phosphorus content. Some phosphorus and fluorine compounds are volatile and poisonous. This imposes increased requirements on the organization of production and finished products of phosphorus slag.

The Kazakh Affiliate of the SoyuzdorNII (All-Union Scientific Research Highway Institute) has issued recommendations on the use of phosphorus slag as a slag-silicate binder for the consolidation of soils and in road construction.

Taking the excellent bonding properties of this slag into account, the Kazniigiprofesfor Institute has organized the production of construction materials at one of the branch factories.

5303

**Shortage of High-Grade Organic Reagents**  
*18410315a Moscow KHIMIYA I ZHIZN in Russian  
No 4, Apr 88 pp 10-14*

[Article by V.A. Polukheyev, Leningrad Engineering Institute imeni Lensoveta, under the title "Compounds From a Jar"]

[Abstract] The author complains about the increasing difficulties encountered by organic chemists in obtaining high-grade organic reagents for pure research. These reagent shortages are attributed to antiquated manufacturing equipment and processes as illustrated by the

Yerevan Chemical Reagent Plant, the claimed relative unprofitability for manufacturers to produce special order reagents as opposed to bulk chemicals for industrial clients, the lack of information about reagent availability, and the apathy and unwillingness of researchers themselves to publicize their plight or press for changes in the supply system. Listed among the reagents in short supply are phenyl methyl ether, chlorobenzene, sulphydryl chloride, thionyl chloride, cyclohexane, methyl chloride, Raney nickel, carbon disulfide, potassium carbonate, and tetrahydrofuran.

6289

#### **Reserves for Raising Efficiency of Centralized Sector Repair Service**

*18410240a Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 12, Dec 87 pp 754-756*

[Article by O.A. Makhun, V.G. Bukin, and K.N. Matukhevich]

[Abstract] One way to escalate chemical production is to raise the efficiency of repair and technical servicing of fixed production capital. Of the total expenditures for major repairs and maintenance made in the chemical industry during 1986, 4.7 percent were for fixed capital, and 7.7 percent were for commodity production. The number of repair personnel in both centralized and decentralized subdivisions of production associations and enterprises was 27.5 percent of the total number of industrial production personnel in the sector. An analysis of the technical-economic indicators of the activities of repair services of chemical enterprises conducted by the Scientific Research Institute for Technical Economic Research of the USSR Ministry of the Chemical Industry showed that, as before, the amount of worn-out fixed capital in the sector is increasing. Large quantities of obsolete and physically worn equipment also introduce the problem of equipment repair and maintenance. Nearly 95 percent of the sector's chemical enterprises are using a mixed form of repair operations wherein the percentage of work done under contract depends on its complexity and the capabilities of the enterprise. In 1986, over 42 percent of the total volume of major

repairs in the sector were carried out by contract organizations. Of these, 20 percent were done by organizations of the Ministry of the Chemical Industry and 28.9 percent by organizations from other ministries. Some improvement in repair service is being made through the establishment of repair-construction-assembly subdivisions of associations in certain so-called "hot spots" of the country. In 1986, trusts were established in Sokale, Kalushe, and Shevchenko. Other areas of improvement include rapid retirement of obsolete equipment and continual improvement in the machine and mechanical inventories of repair organizations.

12765

#### **Automated System for Operational Accounting of Basic Production at Chemical Enterprises**

*18410240b Moscow KHIMICHESKAYA PROMYSHLENNOST in Russian No 12, Dec 87 pp 757-758*

[Article by F.I. Orlov, T.I. Vladimirova, Yu.D. Edelstejn, V.V. Boldyrev, A.S. Federov, and A.A. Kuzin]

[Abstract] The current restructuring of management mechanisms at enterprises of the chemical industry requires, above all, organizing a system for efficient and reliable production accounting. This may be achieved only by introducing an automated system of efficient accounting as is now being implemented at the Novomoskovskiy Branch of GIAP (State Scientific Research and Design Institute of the Nitrogen Industry and Organic Synthesis Products) and other organizations. This system is designed to automate operations accounting at a chemical enterprise over daily (shift) or monthly time intervals for the following functions: fulfillment of daily (shift) and monthly programs for output and delivery of production; supply of feedstock, other materials, and power to the production program; accounting and analysis of plan fulfillment by shop, aggregate, and other cost accounting subdivisions; and balances of material energy streams. A brief description of typical project solutions for an SM and YeS computer complex is presented. It is based on the modular principle and assumes maximum automation of initial information input from sensors through a module and to the SM computer with further aggregation of information to the "shift" level and transmittal to the YeS computer where base data are input and output information is received.

12765

**Magnetic Liquid Sealant Described**

*18410321b Riga NAUKA I TEKHNIKA in Russian No 4, Apr 88 p 20*

[Article by Boris Morozov, engineer, under the rubric "The Councils Respond;" "Liquid Sealant;" first paragraph printed bold]

[Text] Rubber seals usually used to seal rotating parts in machinery are simple and inexpensive. But one often hears complaints about premature failure. The contrivances of engineers trying to ensure high quality in these parts have not brought about a radical improvement. Therefore, fundamentally new designs are needed. Engineer Boris Morozov from Volgograd suggests one.

We know how much bother all sorts of collars, sealing rings, and packing glands on shafts cause during equipment operation and maintenance. Rubber loses its elasticity in time, and its seal is destroyed.

But a new type of seal which uses a magnetic liquid seems to solve many problems. A shaft is surrounded by a ring magnet which creates a constant magnetic field. Pole pieces made of magnetically soft material in the form of insertion rings are inserted to concentrate the magnetic field in the space between the shaft and the seal. When the seal is assembled, the space is filled with a magnetic liquid which reliably holds the magnetic field.

The magnetic liquid is a solution of ferromagnetic particles of up to several microns in diameter in a liquid solution. This solution can be based on liquid lubricating oils. Modern technologies permit production of stable solutions with magnetic susceptibility. They successfully combine magnetic properties with those of ordinary liquids—they fill minute spaces and reliably hold a magnetic field.

The use of magnetic liquids can ensure a complete seal not only in significant pressure and temperature gradients, but even with pulsed pressure. These seals are formed from several sections. The pole pieces are made in the shape needed to strengthen the magnetic field's concentration (cf. USSR Author's Certificate No. 340814 published in Bulletin No. 18, April 5, 1972; Author's Certificate No. 631726, Bulletin No. 41, November 5, 1978; Author's Certificate No. 368434, Bulletin No. 19, March 30, 1973; Author's Certificate No. 653470, Bulletin No. 11, March 30, 1979).

It is not mandatory that seals on already operating structures be changed. Applying a ferromagnetic layer to the surface of a coupling or collar and introducing the liquid can raise the reliability and efficiency of existing structures (cf. Author's Certificate No. 823720, Bulletin No. 15, April 23, 1981 and Author's Certificate No. 1020674, Bulletin No. 20, May 30, 1983). These alterations are within the capabilities of any enterprise.

The liquid seal is capable of "self-healing"—a cavity formed if the seal is damaged is immediately filled with magnetic liquid. Another advantage is ease of repair. One need only add liquid, and the serviceability of a coupling or gland is restored.

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12809/12223

**Kinetics of Kanamycin Ion Exchange on Biporous Sorbents Cellosorb-K**

*18410302a Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 2, Feb 88 (manuscript received 16 Jul 84) pp 386-392*

[Article by G.V. Samsonov, G.A. Tishchenko, K.P. Papukova, A.T. Melenevskiy, and V.S. Pirogov, High-Molecular Weight Compounds Institute, USSR Academy of Sciences, Leningrad]

[Abstract] One of the drawbacks of ion-exchange processes on synthetic immobile phases, especially in the case of labile physiologically active ions, is their great duration, which is caused by the ion exchangers' low kinetic permeability relative to ions having a complex structure and high molecular mass. Accelerating this process requires shortening the diffusion path for these organic ionites or creating composite structures consisting of microdispersed ionite particles impregnated with granules of highly porous polymer matrices with a high kinetic permeability for large organic ions. The ion-exchange kinetics of the antibiotic kanamycin were investigated on biporous sorbents Cellosorb-K by evaluating the effect of the size of the immobilized carboxyl particles, the size of composition granules, and the degree to which the hydrophilic matrix was filled. It was shown that the effective diffusion coefficients of kanamycin on Cellosorb-K were one order of magnitude higher than on standard KB-Zn-2,5 sorbent. The ion-exchange time was 100-fold shorter, and it did not depend on the degree to which the Cellosorb matrix was filled. It was shown that immobilization of dispersed particles on a porous Cellosorb matrix resulted in some structural changes, which were reflected in the altered physicochemical characteristics and kinetic permeability of the Cellosorb-K sorbents. Figures 5; references 14: 12 Russian, 2 Western (1 by Russian authors).

7813

**Stabilization Mechanism of Gaseous**

**Microbubbles by Membrane Made of Surfactants**

*18410302b Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 2, Feb 88 (manuscript received 10 Nov 86) pp 411-415*

[Article by I.A. Voytsekovich, Institute of Medical and Biological Problems, Moscow]

[Abstract] Microscopic studies of the behavior of microbubbles stabilized with surfactant in sea water, distilled water, and gelatin showed that the life expectancy of the

stabilized bubbles is 5 to 6 orders of magnitude higher than that of the nonstabilized ones. Static equilibrium of the forces in the microsystem gas-surfactant membrane-liquid was evaluated in this study, these forces being responsible for stabilizing the microbubbles. On the basis of the molecular and monolayer properties of surfactants, an equation was developed to evaluate force distribution in microbubbles with a surfactant membrane and to explain the mechanism of their stabilization. Figures 2; references 13: 5 Russian, 8 Western.

7813

#### **Study of Diffusion of Additives from Polymeric Metering Tank**

*18410318d Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 61, No 3, Mar 88 (manuscript received 13 Nov 86) pp 599-606*

[Article by T.M. Cherpalkova, Ye.G. Kochina, L.P. Zaychenko, and V.A. Proskuryakov, Leningrad Engineering Institute imeni Lensovet]

[Abstract] A study of the controlled feeding of detergent, antioxidant, and anticorrosion additives to lubricating oils from porous crosslinked polymeric carriers is reported. The additive carriers were prepared by polymerizing ethylene glycol and triethylene glycol dimethacrylates, butyl methacrylate, styrene, and divinylbenzene in mixtures with solutions of zinc dialkyldithiophosphate, high-ash calcium sulfonate, and high-ash calcium alkylsalicylate. The resulting additive carriers contained 80% additives and 20% polymer. The diffusion of the additives into oil was studied by immersing additive carrier specimens in oil and stirring it at 80°C. The pore structure of the carriers permits the diffusion of dissolved additives as well as colloidally dispersed additives. The diffusion of zinc dialkyldithiophosphate into oil is 2 to 3 times as rapid as that of the colloidally dispersed calcium compounds. Copolymers of divinylbenzene and styrene show the most rapid diffusion of the additives. Additive carriers prepared from oligoesteracrylates and divinylbenzene and their copolymers with styrene and butyl methacrylate are macroporous, and their pore-size range is broad. References: 10 Russian.

12973

UDC 541.183

#### **Study of Sorption of Trace Components of Sea Water on Fiber Ionite VION KN-1**

*18410248a Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 61, No 1, Jan 88 (manuscript received 30 Sep 86) pp 42-46*

[Article by E.M. Kats, Ye.G. Abramov, Ye.K. Vulson, and A.N. Barash, Institute of Geochemistry and Analytical Chemistry]

[Abstract] Ion exchange fibers are attracting much attention owing to their high rates of sorption and desorption of metals, which makes them especially suitable for

preconcentrating trace elements and extracting valuable components from natural and wastewaters. The present work is devoted to the study of the sorption properties of VION KN-1, a fiber ionite containing carboxyl groups, and is a continuation of work on utilizing fiber ionites to extract valuable trace components from seawater. Since the extraction of trace components with ionites includes both sorption and regeneration stages, these results are presented both for a simulated solution and for water from the Black Sea. Copper was selected as a reference trace component, although the possibility of sorption and desorption of other components from seawater under full-scale conditions was also studied. Copper concentration was determined by using an ion selective electrode coupled with atomic absorption with flame atomization; copper, zinc, nickel, and cobalt in the ionite phase from seawater were determined by atomic absorption spectroscopy with laser atomization. The simulated seawater solution consisted of 0.5 N sodium chloride and 0.1 N magnesium sulfate at a pH of 6. Full-scale studies were conducted using Black Sea water and a stationary bed of ionite in a column having a cross section of 120 cm<sup>2</sup> at a throughput velocity of 0.5 m<sup>3</sup>/hr. VION KN-1 has a higher selectivity for copper than does the industrially used AN-31, which is apparently due to the fact that VION KN-1, with its carboxyl groups, has higher-value copper equilibrium constants than does AN-31. The internal diffusion and distribution coefficients were calculated, and the results agreed with values obtained by thin-layer sorption isotherms. Tests showed that complete regeneration of the ionite takes place with 0.5 molar HCl at 30-40 ml per gram. In the full-scale experiments, seawater was force-fed through a fixed bed column of ionite and also through a fixed frame of ionite submerged two meters and perpendicular to the flow. Concentrations of copper, nickel, zinc, and cobalt were determined for both VION KH-1 and Mtilon-T (the latter has thioamide groups). Forty-eight-hour runs through the stationary bed showed very high capacities for copper, nickel, and zinc; on the other hand, with the submerged frame it took 264 hours for the value for nickel to begin to approach that obtained in the stationary bed after 48 hours. Figures 3; references 12 (Russian).

12765

UDC 541.183

#### **Sorption Thermodynamics of Cyanocobalamin with Immobilized Molecular Sorbents in Presence of Surfactants**

*18410248c Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 61, No 1, Jan 88 (manuscript received 7 Apr 87) pp 175-177*

[Article by G.A. Yaskovich, G.E. Yelkin, and L.V. Dmitrenko, Leningrad Pharmaceutical Chemical Institute]

[Abstract] It has been demonstrated in previous works that the addition of anionic surfactants to a system of cyanocobalamin and immobilized molecular sorbent

(styrene-divinylbenzene copolymer) increases its sorption capacity with no significant effect on the rate of the process. The purpose of the present work was to study the effects of anionic surfactants (dodecylbenzosulfonate) on the thermodynamic functions of the sorption of cyanocobalamin with an immobilized molecular sorbent. To facilitate the study, the concentrations of cyanocobalamin in the sorbent were plotted as a function of its equilibrium concentration in solution at temperatures ranging from 5 to 49 degrees C both in the presence and in the absence of 0.4 mmol/l dodecylbenzosulfonate. Model solutions of cyanocobalamin were used in which the concentrations were determined spectrophotometrically. Analysis showed that the experimental data follow a linear relationship, making it possible to calculate equilibrium constants K and limiting sorption capacities both in the presence and in the absence of surfactant. Calculations indicate that the limiting sorption capacity decreases in both cases. In the absence of surfactant, the values for K are low and vary little with temperature, but in its presence, the values for K are greater and they

increase markedly with temperature. In both cases, a linear correlation exists between  $\ln K$  and  $1/T$ , making it possible to compute the thermodynamic functions of the process from the Gibbs-Helmholz formula to derive standard thermodynamic potential, enthalpy, and entropy of sorption. All of the experimental data may be explained by comparing the thermodynamic characteristics of the process with the conclusions reached in a previous work, i.e., despite the competition for sorption sites between the surfactant and cyanocobalamin molecules, anionic surfactants (distinct from cationic) facilitate sorption of cyanocobalamin at low concentrations. This is possible if a complex is formed between cyanocobalamin and the surfactant with hydrophobic bonding. The complex is evidently more hydrophobic than the individual molecules, which causes an increase in the entropy component, which compensates for the magnitude and sign of sorption enthalpy. Figures 2; references: 4 Russian.

12765

**Ignition and Combustion of Oxygen and Hydrazine Mixtures, Chain Branched Process**  
*18410298d Moscow KINETIKA I KATALIZ in Russian Vol 29, No 1, Jan-Feb 88 (manuscript received 5 Jan 87) pp 201-203*

[Article by S.A. Chobanyan, T.G. Mkryan and E.N. Sarkisyan, Institute of Chemical Physics, ArSSR Academy of Sciences, Yerevan]

[Abstract] An attempt to explain the mechanism (thermal mechanism or branched-chain mechanism) by which ignition of hydrazine and oxygen mixtures proceeds involved identification of characteristics which are typical for one of these mechanisms and completely untypical for the other. It was assumed that typical traits of a branched chain process include high sensitivity of the lower limit of ignition to the material and state of the reaction vessel surface, sensitivity to insignificant additions of inhibitors or promoters and the presence of active centers of the radical type in super-equilibrium concentrations in the flame. Experimental findings showed that ignition and combustion of hydrazine and oxygen mixtures at low or moderate temperatures proceed by a branched chain mechanism. There was a high dependence of the ignition limit on the state of the reactor surface. In a freshly washed and evacuated reactor at high temperatures, while approaching a limit by means of a gradual increase in pressure, the first 2-3 flashes were much higher than the stabilized ignition limit obtained after about 100 flashes. Brief admission of atmospheric air into the reactor with subsequent evacuation raised the ignition level again (to approximately the original value). Thus, reversible changes of state of the surface reversed changes in the ignition conditions of the  $N_2H_4O_2$  mixtures, which is a typical feature of a branched chain process. Figures 2; references 12: 7 Russian; 5 Western.

02791

**Structural Transformations During Gas-free Combustion of Titanium-Carbon and Titanium-Boron Systems**  
*18410170a Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 297, No 6, Dec 87 (manuscript received 19 Mar 87) pp 1425-1428*

[Article by A.S. Rogachev, A.S. Mukasyan, and A.G. Merzhanov, Institute of Chemical Physics, Chernogolovka Branch, USSR Academy of Sciences, Moscow Oblast]

[Abstract] The study of the titanium-carbon system used stoichiometric mixtures of titanium powder and soot or ground graphite, and the study of the titanium-boron system used amorphous and crystalline types of boron powder. The temperature of combustion reached 3000 K, and an electron microscopic study showed that interaction of the reagents began simultaneously with the beginning of metal fusion. The primary product of the

reaction appeared in the form of small (less than  $10^{-6}$  m) particles of non-stoichiometric carbide with the size of the titanium carbide being unrelated to the size of the initial reagents. The sizes of carbon particles in the after-burning zone increased rapidly and approximated a stoichiometric composition. The rate of growth of carbon particles in the titanium-graphite system was 2-3 times less than that in the titanium ash system, due to the lower real temperature of combustion. Study of the titanium-boron system produced approximately the same results. Figures 3; references 10 (Russian).

02791

**Vaporization of Carbon Particle in Strong Optical Field**  
*18410263a Novosibirsk FIZIKA GORENIYA I VZRYVA in Russian No 1, Jan-Feb 88 (manuscript received 17 Jun 86) pp 41-48*

[Article by V.I. Bukatyy, V.N. Krasnoperov, and A.M. Shayduk, Barnaul]

[Abstract] A previously reported model of the combustion of a carbon particle in a laser beam describes the variation of the temperature and radius of the particle with time for surface temperatures up to 3,700 K, at which point the vaporization of carbon is negligible. The model reported in the present paper describes the vaporization of a carbon particle burning in air in a strong laser beam that produces surface temperatures higher than 4,000 K, at which point the vaporization of carbon is significant. A model of the effect of vaporization on the rate of combustion of an aerosol particle in a strong laser beam is discussed. It is found that heterogeneous combustion ceases when the laser beam is sufficiently strong. Then the rate of change of the particle radius becomes a linear function of the energy-flux density and is practically independent of the particle size. References: 15 Russian.

12973

**Attenuation of Shockwaves by Shielding Grates**  
*18410263c Novosibirsk FIZIKA GORENIYA I VZRYVA in Russian No 1, Jan-Feb 88 (manuscript received 11 Nov 85) pp 115-118*

[Article by B.S. Kniglikov and A.G. Kutushev, Moscow]

[Abstract] It is known that shockwaves can be attenuated by dispersed condensed materials suspended in air. A similar effect of shielding with fine grates was previously reported by one of the authors of the present paper. The present paper presents a mathematical model of attenuation of shockwaves by shields made of fine grates. The model treats the grates as a "frozen" suspension of immovable particles. It is shown that fine grates are effective attenuators of shockwaves even when the volume fraction of the condensed phase in the grates is as low as 0.1 to 1 percent. Because the effects of interface

thermal interaction ( $Q$ ) was found to have only a weak effect on shockwave attenuation compared with the effects of the strong interaction of the F phases, the effect of contact heat exchange may be ignored in a number of practically important cases. References: 11 Russian.

12973

**Estimating Critical Volumes of Dispersed Material with Thermal Spontaneous Combustion**  
*18410294b Moscow KHMICHESKAYA PROMYSHLENNOST in Russian No 1, Jan 88 pp 62-63*

[Article by K.S. Koltsov]

[Abstract] This article presents the results of a study of thermal spontaneous combustion of alcohol-soluble aniline black powder in containers of various shapes at various ambient temperatures based on thermal detonation theory. The results are compared with experimental data obtained on cubic specimens. Previous studies have recommended that cubic specimen data be applied to specimens of different shapes by considering the specific surface. This article suggests that this extension of the data is not justified. The error resulting from differences in geometric shape may reach 15 percent.

6508

**Step-by-Step Combustion of Methane-Chlorine Mixtures**  
*18410241a Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 298, No 2, Jan 88 (manuscript received 6 May 87) pp 405-407*

[Article by A.I. Rozlovskiy, A.V. Steblev, and Yu.Ye. Frolov, presented by Academician Ya.B. Zeldovich on 6 Mar 87]

[Abstract] It has been shown previously that during flame propagation, resulting from chlorine-alkane mixtures, in a closed vertical reactor, both temperature and pressure, as measured along several points along the axis of the reactor, increase after initiation of combustion (in the upper portion) in two stages. This was the basis for concluding that the combustion process of such mixtures is a two-step process, although the unbranched chain mechanism of the reaction provides no basis for such an interpretation. Nor can the observed phenomena be explained on the basis of autoignition of products of incomplete conversion in the primary flame. The two-step nature of the combustion of chlorine-alkane mixtures has only been observed in closed vessels; combustion in an open tube remains a single step process. In the present work, a study was made of the possibility of step-by-step combustion of a 55:45 percent methane-chlorine mixture with direct observation of the spherical flame after electric spark ignition at the center of a 125 mm diameter spherical glass vessel. Combustion features were observed with cinematography at 36 frames per

second. Experiments were conducted at both constant volume and constant pressure. During the initial stage of combustion under isochoric conditions up to frame 4, the visible flame propagated at its highest velocity and rapidly diminished from 72 to 18 cm/s. The flame remained spherical in shape in the first three frames but started to become blurred in frame 4. Beyond frame 7 (0.194 sec), the visible image of the flame began to disappear with no illumination until frame 10 (0.278 sec), at which point weak illumination of the upper half of the flame sphere began to reappear but did not propagate to the reactor walls. The image had the appearance of two disks superimposed on each other and gradually drifting apart. After reillumination at frame 10, pressure started to increase markedly. Under isobaric conditions, the diameter of the flame sphere remained somewhat smaller than under isochoric conditions up to frame 4, after which it increased rapidly and exceeded that of the isobaric. Thus, specific features were observed under both conditions, and the observed complexities of flame propagation in conjunction with the limiting simplicity of the initial systems exclude the formation of intermediate products having exceptional reactivity. However, it is possible that yet-unknown processes take place in the flame that form complex intermediate components, such as free radicals whose nature has not yet been established. References 4 (Russian).

12765

**Criteria for Stable Extinction of Solid Fuels by Addition of Coolant**  
*18410241b Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 298, No 5, Feb 88 (manuscript received 3 Sep 87) pp 1148-1151*

[Article by V.N. Bordakov and Corresponding Member USSR Academy of Sciences V.V. Vengerskiy]

[Abstract] The use of powerful MHD-generators operating on the combustion products of special solid fuel has expanded the possibilities of electromagnetic sounding of the earth's upper mantel. MHD-generators of this sort are being used to study the geological structure of the Kola peninsula and seismic dangers in Central Asia. One feature of existing pulsed MHD-generators is continuous operating conditions from the moment of onset to total combustion of a solid fuel, and one way to improve them is through the creation of a plasma generator operating in a multiple on-off mode according to a flexible cyclogram. Thus, selection of a method and conditions for stable extinction of a solid fuel plasma becomes a practical necessity. Combustion of a solid fuel containing 9 to 10 percent metallic fuel under normal conditions can be suppressed by adding a coolant such as water into the combustion chamber. The pressure drop resulting from phase changes of the coolant has little effect on the stability of the extinction processes in such fuels. A review of work on extinction of solid fuels in rocket engines indicates that a generally accepted criterion for stable extinction of condensed fuels with a coolant has not yet been developed. In the present work the solid fuel extinction process was considered as a simplified thermal combustion model assuming that the surface of hot powder

is uniformly irrigated with a high velocity stream of dispersed coolant droplets. The thermophysical properties of the fuel and the coolant were assumed to be constant and the extinction process considered to be a cooling of a nonisothermally heated wall by a dispersed stream of coolant. Under these conditions, extinction may be expressed mathematically. This was developed further into a general relationship for the minimally required time of coolant injection for stable extinction with parameters for solid fuel, combustion chamber, and Bio's criteria for heat exchange. This generalization was confirmed experimentally by a previously described method using type H-1 powder containing aluminum. The expression can also be used successfully to analyze solid fuel extinction conditions by the combustion chamber pressure drop mechanism. References 15: 11 Russian, 4 Western.

12765

UDC 543.87-145.4:541.127:541.17:[547.582.1+546.33·171.8]:541.12.031

#### Reactivity of Sodium Azide in Topochemical Reaction with Benzoyl Chloride

18410340b Moscow KINETIKA I KATALIZ in Russian  
Vol 29, No 2, Mar-Apr 88 (manuscript received  
12 Nov 86) pp 478-481

[Article by V.A. Zlobin and A.K. Tarasov, Kuybyshev Polytechnical Institute imeni V.V. Kuybyshev]

[Abstract] In order to determine the influence of sodium azide type on reaction rate with acid chlorides in low-polarity solvents, the authors studied the interaction of benzoyl chloride in o-xylene with several specimens: freshly prepared, 15-day-old, 30-day-old, and several-year-old specimens; a specimen that had been stored for several years and reprecipitated from water by acetone with and one that had been reprecipitated without hydrazine present; a freshly prepared, mechanically ground specimen; an "amide" specimen that had been stored for several years; and an "amide" specimen that was reprecipitated without hydrazine. The kinetics of the topochemical reaction of these sodium azide specimens with benzoyl chloride were studied, and it was found that the reactivity of the specimens varied with their content of sodium carbonate, which blocks the surface of the solid reagent. Mechanical activation of sodium azide was also found to be possible. The specimen of freshly prepared sodium azide subjected to mechanical grinding was found to have sharply higher activity as a result of the grinding, apparently as a result of a change in its structure and the creation of fresh surfaces having a greater chemical activity. This mechanical activation also increases solubility and dissolution rate. References 15: 11 Russian, 4 Western.

6508

**Methods of Intensifying Certain Electrochemical Processes**

18410279a Moscow ELEKTROKHIMIYA in Russian  
Vol 29, No 1, Jan 88 (manuscript received  
19 November 86) pp 3-17

[Article by A.D. Davydov and G.R. Engelhardt, Electrochemistry Institute imeni A.N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] This article reviews the literature on accelerating electrochemical reactions. The following topics are covered: methods of increasing current density; methods of lowering electrode polarization (various methods of agitating electrolytes; using the migration mechanism of ion transport; increasing the concentration of the reacting substance; using ultrasound agitation of electrolytes and vibration of electrodes; mechanical depassivation of the electrodes; UV, laser, electron beam, and gamma irradiation of electrodes; using bipolar voltage; increasing the catalytic activity of electrodes by proper selection of electrode materials; decreasing interelectrode resistance; using increased voltages; using high temperatures and pressures and modifying electrolytes so as to permit the use of high current densities); methods of increasing the current yield; methods of increasing the chemical equivalent; and ways of determining the electrode surface area. References 58: 34 Russian, 24 Western.

12973

**Electrochemical Behavior of Lithium Electrode in Sulfolane**

18410279b Moscow ELEKTROKHIMIYA in Russian  
Vol 29, No 1, Jan 88 (manuscript received 12 Feb 88)  
pp 18-20

[Article by V.S. Kolosnitsyn, A.V. Popov, Yu.Ye. Nikitin, Bashkiria Section, Chemistry Institute, USSR Academy of Sciences, Ufa]

[Abstract] The behavior of lithium electrodes in sulfolane, with lithium perchlorate as a background electrode, was studied because sulfolane is a promising solvent for lithium chemical current sources. All measurements were made in a thermostatted cell equipped with three lithium electrodes fused into glass tubes. A potentiostatic method was used to measure the exchange currents with a voltage sweep rate of 10 to 20 mV/s. Kinetic curves show that exchange currents fall rapidly when the electrode surface is fresh and that they stabilize at a nearly constant level after the electrode has been immersed for about 20 hours. The exchange currents increase linearly with the background salt concentration when the electrode is fresh and show maxima when the electrode is aged, the maxima occurring at increased salt concentrations as the temperature increases. Activation was found to differ considerably between steady-state and polarizing electrodes and to vary with the background salt concentration, showing a maximum at 0.5 to 0.6 moles

per liter. Activation energy is independent of the degree of polarization. The nature of the rate-limiting step was not determined. References 11: 6 Russian, 5 Western.

121973

**Photoelectrochemical Behavior of Semiconductor Diamond**

18410279c Moscow ELEKTROKHIMIYA in Russian  
Vol 29, No 1, Jan 88 (manuscript received 21 Oct 86)  
pp 69-73

[Article by A.Ya. Sakharova, M.D. Krotova, Yu.V. Pleskov, L.L. Buylav, and B.V. Spitsyn, Electrochemistry Institute imeni A.N. Frumkin, USSR Academy of Sciences, Moscow, and Physical Chemistry Institute, USSR Academy of Sciences, Moscow]

[Abstract] Since diamond is expected to be used in semiconductor photoelectrochemistry as a photoelectrode material or a protective film for photoelectrodes, a study was conducted to determine the electrochemical and photoelectrochemical properties of polycrystalline 10- to 20-micron thick diamond film electrodes that were grown from the gas phase on a tungsten base. Their potential-current and potential-capacitance characteristics were measured at room temperature, in darkness and in light, in neutral and acidic solutions, and in helium, oxygen, and air. The results were presented in the form of potential-current curves in darkness and in light, potential-current squared curves in light, and potential-capacitance curves. It was discovered that the semiconductor properties of diamond affect its electrochemical behavior. References 7: 6 Russian, 1 Japanese.

12973

**Electrochemical AC Circuits in Presence of Hydrodynamic-Velocity Surges of Electrolyte**

18410279d Moscow ELEKTROKHIMIYA in Russian  
Vol 29, No 1, Jan 88 (manuscript received 14 Nov 86)  
pp 99-102

[Article by S.A. Martemyanov and B.M. Gratov, Electrochemistry Institute imeni A.N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] Theoretical analysis shows that hydrodynamic-velocity surges of an electrolyte, as a source of external perturbations of a redox system, can be taken into account by introducing a circuit of additional components—hydrodynamic current generators—into the equivalent electrical circuit. The amount of current thus generated is proportional to the amplitude of the electrolyte's velocity fluctuation. This, together with the equations to determine the hydroelectrochemical impedance by relating the magnitude of the potential surges at the ends of the electrochemical surges (in a galvanostatic mode) or the magnitude of the surges occurring through the electrochemical current cell (in a potentiostatic

mode) with the amplitude of the electrolyte's hydrodynamic-velocity surges (which is shown), generalizes the classical Ershler-Rendls scheme for the case where there are hydrodynamic-velocity surges in an electrolyte. References 12: 6 Russian, 6 Western.

12973

### **Investigation of Composition and Electrochemical Properties of Polymer and Low-Molecular Weight Complexes of Viologens with Potassium Ferrocyanide**

*18410303a Moscow ELEKTROKHIMIYA in Russian Vol 24, No 2, (manuscript received 22 Jul 86) Feb 88 pp 147-151*

[Article by A.A. Nekrasov, V.F. Ivanov, A.V. Vannikov, and V.A. Tverskoy, Institute of Electrochemistry imeni A.N. Frumkin, USSR Academy of Sciences, Moscow]

[Abstract] The viologens (N,N'-derivatives of 4,4'-dipyridinium) are important organic electrochromic materials because they are used in the production of various electrochromic displays, optical filters with alternating densities, light flux modulators, etc. The goal of this work was to evaluate the composition, spectral characteristics, and electrochromic properties of low-molecular and polymer complexes of viologens with a ferrocyanide ion using heptylviologen dibromide and polypentamethyleneviologen dibromide as respective models. The absorption maximum of the polymer complex was shifted toward the short wavelength in comparison with the low-molecular weight complex; the composition of these complexes was 1.5:1 and 2:1 viologen molecules per ferrocyanide ion, respectively (polymer versus low-molecular weight complexes). The stability constants and extinction coefficients were determined. Differences were noted in the structures of these complexes that must be considered when producing electrochromic units based on such complexes. Figures 6; references 6: 4 Russian, 2 Western.

7813

### **X-2071 Meter for Measuring Emittance of Electrochemical Systems in Low and Infralow Range of Frequencies**

*18410303b Moscow ELEKTROKHIMIYA in Russian Vol 24, No 2, Feb 88 (manuscript received 25 Dec 86) pp 184-189*

[Article by V.I. Kenzin and S.P. Novitsky, Solid-State Chemistry and Mineral Raw Materials Processing Institute, Siberian Division, USSR Academy of Sciences, Novosibirsk]

[Abstract] The X-2071 emittance meter for use in measuring electrochemical systems was evaluated. The unit is based on previously developed principles of rapid determination of various parameters of complex electrical signals. It overcomes some of the difficulties plaguing

other devices: slowness, low accuracy, etc. Some of the X-2071 meter's technical data are as follows: working frequency range,  $10^{-3}$  to  $10^3$  Hz; range of measurable impedances, 1 to  $10^6$  Ohms; value of alternating voltage in the object under investigation, not more than 5 mV; relative emittance measurement error at tangents of dielectric losses  $\tan\delta = 0.1$  to 10, not more than 3 percent. The X-2071 meter makes it possible to regulate the measuring mode required of the electrode and to condition information signals in analog and digital form. Figures 2; references 7: 6 Russian, 1 Western.

7813

### **Energy Characteristics of High-Temperature Hydrogen and Carbon Monoxide Fuel Cell. Oxidation of Pure Reagents**

*18410303c Moscow ELEKTROKHIMIYA in Russian Vol 24, No 2, Feb 88 (manuscript received 14 Oct 86) pp 214-216*

[Article by N.V. Korovin, G.N. Voloshchenko, and V.F. Vagin, Moscow Energy Institute]

[Abstract] Electrochemical electric power plants are being developed in many countries; in Japan some units are already operational. High-temperature fuel cells with a solid electrolyte are a promising source of such power. Their advantages include a higher conversion of chemical energy of the fuel into electric power and the possibility of utilizing evolving heat. A number of fuels can be used in high-temperature fuel cells; the present paper deals with pure hydrogen and carbon oxide. All formulas are calculated for hydrogen; carbon oxide formulas are found to be analogous to those for  $H_2$ . Analysis of the curves obtained showed that electric power produced during the passage of  $1 \text{ n } m^3$  of  $H_2$  through high-temperature fuel cells was significantly greater than the electric power obtained from carbon oxide under similar conditions. Heat production is higher for carbon oxide. The specific electric energy drops as the current density increases. The drop is faster in the case of carbon oxide than in that of hydrogen, and the heat liberation in the case of carbon oxide is significantly higher than that for hydrogen. Figure 1; references: 3 Russian.

7813

### **Study of Electrochemical Properties of $LaCo_{1-x}Ni_xO_3$**

*18410303d Moscow ELEKTROKHIMIYA in Russian Vol 24, No 2, Feb 88 (manuscript received 29 Jan 87) pp 234-236*

[Article by N.P. Ivanova, A.V. Kozhukh, V.I. Sonin, I.M. Zharkiy, and V.P. Pakhomov, Byelorussian Engineering Institute imeni S.M. Kirov]

[Abstract] The relatively high conductivity of solid solutions of  $LaCo_{1-x}Ni_xO_3$  and their stability in air at high temperatures makes them useful as resistive materials or

as oxygen electrodes in high-temperature solid electrode systems. Such compositions are beginning to replace traditional noble metal electrodes. Solid solutions of  $\text{LaCo}_{1-x}\text{Ni}_x\text{O}_3$  show the greatest resistance at  $x = 0.3$  to 0.5 and a temperature expansion coefficient of (12 to 13)  $\times 10^{-6} \text{ K}^{-1}$ ; at 770 K their conductivity changes from the semiconductor to the metallic type. The goal of this work is to study the electrochemical properties of electrodes made of  $\text{LaCo}_{1-x}\text{Ni}_x\text{O}_3$  that are in contact with a solid electrolyte ( $\text{ZrO}_2$ ). It is shown that  $\text{LaCo}_{1-x}\text{Ni}_x\text{O}_3$  possesses excellent properties for an electrode material: high conductivity, air stability up to between 1,570 and 1,670 K, chemical inertness relative to solid electrolytes, similarity of temperature expansion coefficients, and relatively low polarization. Figures 2; references: 3 Russian.

7813

#### Quantum Yields of Photoinjection of Electrons from Mercury into Aqueous Solutions of Electrolytes

18410314b Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 299, No 5, Apr 88 (manuscript received 4 Aug 87) pp 1166-1170

[Article by V.V. Konovalov, A.M. Raytsimring, and Yu.D. Tsvetkov, corresponding member, USSR Academy of Sciences, Chemical Kinetics and Combustion Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] One of the main characteristics of photoinjection of electrons from metals into solutions of electrolytes is the quantum yield of photoinjection, whose value is dependent on both the frequency of the incident light and on the polarizing potential of the photoelectrode. Quantum yield measurements made earlier were limited to the threshold photoinjection region. Later studies (such as V.V. Konovalov, et al., CHEM. PHYS., Vol 93, No 1, 1985) were devoted to an increase in the accuracy of measurements of photoinduced signals and broadening the frequency range of light by the use of eximer lasers, thereby making it possible to return to further determining the characteristics of photoinjection of electrons from metals into electrolyte solutions. The light sources used were eximer lasers with a light pulse duration of 5 ns at half-amplitude. The light intensity incident on the photoelectrode was attenuated to 20 to 50  $\text{kW/cm}^2$ . The measurements were made in a 0.5 M KCl solution using  $\text{N}_2\text{O}$  as the acceptor. The most widely used model for describing the photoemission of electrons from metals is the three-stage Spicer model, in which the photocission process is broken down into three successive stages: optical excitation of an electron in the zone of metal conductivity, motion of an electron toward the surface with allowance for elastic and inelastic scattering, and escape beyond the limits of the metal surface. It was found that such a staged approach can also be used in describing the photoinjection process, but a fourth stage must be added: motion of an electron in the medium until thermalization and solvation occur. The

need to make an allowance for this last stage was due to the possibility that the electrons would return to the photoelectrode in the thermalization process. The quantum yields computed by using the four-stage model are illustrated in a graph. The computed curves are quite consistent with the experimental curves. The photoinjection quantum yields are an order of magnitude less than for photoemission. This supports the conclusion that during photoinjection up to 80 to 90 percent of the electrons are returned to the photoelectrode in the course of thermalization and make no contribution to the measured quantum yield. Figures 3; references 14: 9 Russian, 5 Western.

5303

#### Processes in Manganese-Air-Zinc Current Sources

18410318b Leningrad ZHURNAL PRIKLADNOY KHIMII In Russian Vol 61, No 3, Mar 88 (manuscript received 31 Mar 86) pp 490-495

[Article by V.Ye. Kazarinov, M.R. Tarasevich, K.A. Radyushkina, Ya.B. Shumelevich, A.V. Dribinskiy, Yu.M. Volkovich, I.A. Kukushkina, N.M. Zagudayeva, S.B. Orlov, G.V. Shteynberg, G.A. Davtyan, L.P. Yesayan, and S.P. Derenskaya, Electrochemistry Institute imeni A.N. Frumkin, USSR Academy of Sciences]

[Abstract] Studies of carbon catalysts and mass transfer in alkaline batteries with manganese-air-zinc elements and electrolytes thickened with flour and starch are reported. Oxygen reduction polarization curves show that the reduction of oxygen on carbon is not significantly affected by treatment of carbon with ammonia, chlorine, and helium, but treatment of carbon with air and carbon dioxide increases the rate of reduction by a factor of 2 to 3. There is an optimal ratio of basic to acidic groups on carbon surface at which carbon shows a maximal catalytic activity. The addition of catalysts such as EDM or silver to carbon shortens the battery life without affecting the power or storage life. The use of modified carbon KM-2 in alkaline batteries with zinc-air and manganese-air elements makes it possible to eliminate the use of EDM in these batteries. References 8: 7 Russian, 1 Western.

12973

#### Effect of Cationic Composition of Electrolyte on Efficiency of Li/MnO<sub>2</sub> Current Sources

18410318c Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 61, No 3, Mar 88 (manuscript received 1 Aug 86) pp 495-499

[Article by Yu.V. Mikhaylik, F.A. Bodachevskiy, N.A. Chmilenko, N.V. Chetakova, and V.D. Prisyazhnny, General and Inorganic Chemistry Institute, Ukrainian SSR Academy of Sciences]

[Abstract] A study of the effect of lithium, sodium, and potassium ions in fluoroborate electrolytes on the capacity, voltage-current characteristics, and internal discharge of

lithium-manganese dioxide cells is reported. In the case of lithium fluoborate electrolytes ranging in concentration from 0.2 to 3 M, the capacitance and the internal discharge at first increase sharply and then reach a plateau lying between 1 and 3 M. In the case of electrolytes containing lithium and sodium fluoborates, the capacitance decreases with increasing concentration of sodium ions, and the internal discharge does not, for all practical purposes, change when the total cation concentration is 1 M; below 1 M, the effect of sodium ions and the internal discharge increase. The results with saturated potassium fluoborate containing 0.25 to 1 M lithium fluoborate are similar to those obtained with pure lithium fluoborate, but a pure potassium fluoborate electrolyte leads to swelling of the cells held at 80 °C. The results are explained by using literature data regarding electrolyte conductivity and diffusion in electrolytes. References 10: Russian 6, Western 4.

12973

**Effect of Anionic Composition of Electrolyte on Anode Behavior of Lithium in Solutions of System LiCl-LiOH-H<sub>2</sub>O**

18410186c Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 60, No 11, Nov 87 (manuscript received 14 Jul 86) pp 2578-2579

[Article by A.I. Demidov, O.A. Kungurtsev, and A.G. Morachevskiy]

[Abstract] A study was made of the effects of the anionic composition of the electrolyte in LiOH-LiCl-water solutions at 298 K. The methodology for preparing the solutions and recording the polarization curves was described in a previous publication. The molality of the lithium chloride solutions ranged from 0.28 to 2.83; the lithium hydroxide molalities were 3.5 and 4.5. As the lithium chloride content was increased, anode polarization curves taken with a lithium electrode displayed increases in the maximum and limiting currents in the first wave and the appearance of a second wave. The higher the concentration of lithium hydroxide, the more lithium chloride was needed to fix the second wave on the polarization curve, and as the LiOH concentration was increased, the potential at which the second wave initiated became more negative. This is evidently due to the participation of hydroxyl and chloride anions in the electrochemical processes taking place at the lithium electrode. A two-stage reaction mechanism is proposed wherein an anion is adsorbed on the metal surface to form a surface complex in the first stage followed by ionization of a metallic ion entering the complex in the second stage. If two anions are adsorbed on the electrode simultaneously, the anode solution process flows along two parallel routes. To confirm a hypothesis that the second wave on the polarization curves is related to the participation of chloride ions in the anode process, polarization curves were taken with a lithium electrode in LiOH-water solutions at 298 K and LiCl molalities of

between 11 and 15. The curves appeared almost identical at all of the various concentrations of LiOH, and the lithium anode dissolution current was found to be directly proportional to the polarization potential. Also, since the lithium chloride concentration in the LiOH-water system was higher than that in the LiCl-LiOH-water system, the potential for anode dissolution initiation with chloride ion participation has a more negative value. Therefore, the results confirm the hypothesis. Figures 1; references 6: 4 Russian, 2 Western.

12765

**Effects of Structural Parameters of Macrocyclic Complexes on Specific Energy Characteristics of Cathode Materials Based on Them**

18410188b Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B, GEOLOGICHESKIYE, KHMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 87 (manuscript received 24 Jun 87) pp 48-51

[Article by O.A. Mashkin, Ye.V. Kuzminskiy, and Academician of the UkrSSR Academy of Sciences A.V. Gorodyskiy, Institute of General and Inorganic Chemistry, UkrSSR Academy of Sciences, Kiev]

[Abstract] When studying the possibilities of utilizing complexes of metals with organic ligands as cathode materials (KM) in the new generation of chemical sources of electrical current (KhIT), a question arises concerning the relationship between the specific energy characteristics of a KM based on such compounds and their physicochemical properties and structure. Although reviews have been published on cathode materials based on organic complexes and complexes of metals with organic ligands, they only included values for specific energy characteristics and omitted the materials' interrelationship with physicochemical properties, although this could be useful in the search for new cathode materials for KhIT having a lithium cathode. Redox potential and ionicity values of studied materials could provide information for predicting KM characteristics. Cases are also known where the bond ionicity parameter was successfully used to predict specific energy characteristics on the basis of simple inorganic compounds such as sulfides and phosphorus trisulfides. In the present work, tetraazamacrocyclic complexes of copper, being representative of a large class of macrocyclic complexes of transitional metals, was chosen in an attempt to evaluate specific energy characteristics starting with structural features such as the quantity of double and aromatic bonds, degree of oxidation of the central coordination atom of the metal, the presence of a charge on the macrocycle, the size of the substituent on the side chain, and the macrocyclic effect. Permittivity was plotted as a function of the number of double bonds, the number of benzene rings, and the molecular weight of the macrocyclic complex. Increasing the number of double and aromatic bonds in the ligand, decreasing the macrocyclic effect (degree of chelation), and increasing

the degree of oxidation on the central coordinating metal atom result in an increase in specific energy characteristics. Thus, an examination of the relationship between the structural parameters and the specific energy characteristics of a cathode material may be used as a guide in the selection of promising cathode materials for chemical sources of current. Figures 3; references 5: 1 Russian, 4 Western.

12765

UDC 541.11

**Thermodynamic Melt Properties in Gallium-Tellurium and Indium-Tellurium Systems**  
18410343b Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 4, Apr 88 (manuscript received 27 Apr 87) pp 926-931

[Article by V.M. Glazov, L.M. Pavlova, A.L. Lomov, and Ye.B. Ilyina, Moscow Institute of Electronic Equipment]

[Abstract] The thermodynamic properties of gallium-tellurium and indium-tellurium melts have not been

reliably studied in sufficient detail. This article utilizes the electromotive forces method with a solid electrolyte to determine the thermodynamic properties of gallium-tellurium and indium-tellurium system melts throughout the composition range over a broad temperature interval. Measurements were made for the Ga-Te system at 940-1,210 K and for the In-Te system at 860-1,090 K. The activities of the components, integral and partial thermodynamic mixing functions, and excess properties of the melts were determined at the melting points of the congruently melting gallium and indium monotellurides in the respective systems. A tendency toward strong chemical reaction was noted. The complex behavior of the thermodynamic properties with changing composition, considering the phase equilibria in the systems studied, indicate that the peculiarities in the systems' melt behaviors may be related to various associates in the liquid phase. Figures 5, references 17: 8 Russian, 9 Western.

6508

**Environmental Program for Mineral Fertilizer Production Ministry Outlined**  
*18410321a Moscow KHIMIZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 4, Apr 88 pp 24-25*

[Article by V.A. Markov, candidate in phylogenetic sciences, Ministry of Mineral Fertilizer Production: "Under the 'Ekologiya' Program"]

[Text] One of the most important directions in restructuring mineral fertilizer production is the strengthening of efforts to solve problems of environmental preservation. These problems are under constant public scrutiny, are covered in the press, and are becoming a serious subject of discussion in executive bodies. The most decisive measures to change the country's ecological situation have recently been taken.

It is no accident that the highest requirements in this area are imposed on our branch. Mineral fertilizer production is one of the major polluters of the environment.

Analysis of nature preservation activities by the USSR Minudobreniya [Ministry of Fertilizer Production] shows that certain results have been achieved in this area. In the 11th Five-Year Plan and 1986, commercial output by branch enterprises increased almost 50 percent over 1980. At the same time, the demand for fresh water dropped 138.7 million cubic meters, or 7 percent; contaminated waste water discharge, 9 percent. Two-thirds of branch enterprises now dump no contaminated wastes at all, and some of them are discharge-free.

For example, the Pervomaysk Production Association "Khimprom" has developed and introduced a new closed resource-saving industrial water supply and waste treatment system. After treatment, waters enter a control pond. Swans and ducks swim in it, and it has perch, carp, and other fish. The animals duplicate environmental control. This convincingly demonstrates that any chemical production facility can be made ecologically clean.

In the 11th Five-Year Plan and 1986, harmful discharges into the atmosphere were reduced 10 percent. The level to which solid particles were trapped rose to 98; gaseous, 75.3 percent. Many obsolete facilities were closed.

Nevertheless, these results do not satisfy current requirements for protecting the environment from pollution and are arousing censure. The considerable resources expended on natural preservation procedures often do not produce the needed results. For example, in 1987, the Ministry reviewed the ecological situation at the Shchekinsk, Kemerov, and Cherkassk "Azot" Production Associations and at enterprises in Kuybyshev, Aktiubinsk, Dzhambul, and Chimkent Oblasts and the Uzbek SSR. Certain branch enterprises continue to dump contaminated wastes in the basins of the Black, Baltic, and Caspian Seas, which is intolerable. More than

20 percent of dust and gas scrubbing facilities are operating inefficiently, as are 16 percent of the waste water treatment facilities. There are instances of large one-time dumpings.

The basic problems related to nature preservation in branch associations and enterprises are systematically brought for consideration by the Ministry College. The Ministry has developed and approved an ecological program for the 12th Five-Year Plan and the period until the year 2000 as a radical solution to the problem. It encompasses all aspects of nature preservation at enterprises, scientific-research and design organizations, and the branch as a whole.

The program gives special attention to the introduction of low-waste and resource-saving technologies. About one-third of the branch's plants were built before 1970. They account for 67-70 percent of the harmful discharges into the atmosphere and about 85 percent of the contaminated waste water discharge. In the last three five-year plans, branch development has been carried out by the extensive method. Worn and obsolete equipment has been removed slowly. A program for re-equipment of the branch for the period to the year 2000 has been developed to correct the situation. Resources for these purposes will be increased in the 12th and 13th Five-Year Plans. As a result of these measures, the number of obsolete technological processes will be reduced 25-30 percent in the near future. By 1990, about one-third of the equipment will have been updated. Production facilities will be developed not only on the basis of low-waste and resource-saving technologies. Comprehensive use of natural resources and production wastes will become important.

The use of wastes, primarily pyrite cinders, phosphorus production slags, phosphogypsum, halite wastes, and secondary polymer stock, increased in the 11th Five-Year Plan. The variety of secondary raw stock supplied for production of construction materials expanded. In 1987, builders also received a sizeable amount of rock, gypsum stone, gravel-sand mixture, and aluminosilicates.

But this is not enough. The ecological program calls for complete use of pyrite cinders, electrothermal phosphorus slags, and secondary polymer materials in the national economy. The use of phosphogypsum will rise from 2.85 to 23 million tons a year; halite wastes from 11.3 to 31.9 million tons a year. In this five-year plan, eight phosphogypsum processing plants are to be built; the first will go into operation in 1989.

The ecological program reflects current and future plans for environmental preservation and rational use of natural resources, and it assigns enterprises specific tasks in protecting the atmosphere and water reservoirs against pollution and in developing and quickly introducing low-waste and resource-saving production processes and

flows. Automated discharge monitoring systems will be introduced, and standards regulating branch efforts in nature preservation will be developed.

Given the considerable growth in output, carrying out the ecological program will make it possible to improve nature preservation. Harmful atmospheric discharges will diminish, the dumping of contaminated waste waters will stop entirely, and many enterprises will become discharge-free. The development of water recycling systems (the percentage of recycled water will rise from 90 to 96 percent) will make it possible to save fresh water.

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12809/12223

#### USSR-Finnish Joint Venture on Ecology Described

18410322b Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Apr 88 p 3

[Article by M. Butkov: "Kostomuksha—A Sanctuary Region"]

[Text] No one these days is surprised by a joint venture, but a joint—preserve is something else. Unparalleled in world practice, it is being created on the border between the Soviet Union and Finland. The "Druzhba" Preserve is the first joint "enterprise" in the field of ecology, the fruit of cooperation between our countries under a 1985 intergovernmental agreement on protecting the environment.

Forests, lakes, and rivers in the Kostomuksha area—480 square kilometers untouched by human economic activity—have been set aside by the Soviet side; six sections have been defined along the Finnish side of the border, and two of them adjoin ours. The basic directions in "Druzhba's activity will be scientific research to solve general problems of preserving ecological systems in adjacent areas of the Soviet Union and Finland. To protect the plant and animal world, especially rare and disappearing species of flora and fauna common to the territory of both countries, our partners have been given the "USSR Red Book" and the "RSFSR Red Book;" in turn, Soviet specialists have received the "Red Book of Finland."

There are quite a few examples of successful cooperation in environmental protection between the Soviet Union and its northern neighbors. One is the signing, in January of this year, of an intergovernmental agreement between our side and Norway on protecting the environment, the first, by the way, in Norway's diplomatic practice. It encompasses protection of the air basin from pollution, including transnational air pollution traveling long distances across borders, protection and preservation of the

marine environment, protection of water bodies in border areas, ecological systems, marine resources, monitoring the status of the environment, sharing the results of research and information about scrubbing waste gases and treating waste waters from industrial and public sewage plants, and creating waste-free technologies.

The Soviet program for protecting the North's fragile ecological balance includes, in addition, reducing sulfur dioxide discharges into the atmosphere by 55 percent in 1993 as compared to 1980 at the "Severonikel" Combine and by 80 percent at the "Pechganikel" Combine. This is a convincing example of meeting the requirements of the protocol for the International Convention on Long-Distance Air Pollution Across Borders. The Norwegian Environmental Pollution Control Board claims that if participating countries adhere to it, the situation will improve in 3 years.

This approach will finally help solve the problem of acid rain, which, in the words of Birgitta Dal, Sweden's Minister of Energy and Environmental Protection, has become a real scourge to rivers and lakes in Northern European countries. After a recent visit to the Soviet Union, she noted the need for our countries to conclude an agreement on protecting the environment; the Soviet side has already prepared a draft agreement. If it is signed, a firm international legal base will be created for cooperation in ecology between the Soviet Union and its northern neighbors. It will undoubtedly supplement and enrich the collaboration of members of the Northern Council (all the Scandinavian countries and Finland) under the 1976 Northern Convention on Environmental Protection.

In recent years, the Soviet Union and Northern European countries have experienced the ascendancy of an "ecological conscience." Public opinion polls reveal serious concern about the state of nature. In Norway, for example, 85 percent of those asked believe that they will witness an ecological disaster in their lifetime, and almost 80 percent are ready to sacrifice material well-being to save the habitat.

Our northern neighbors have taken the Soviet formula as an inspiration: the problems of environmental protection are just as important for mankind as are problems of war and peace. To unite forces, to make them more goal-oriented—this is the goal of the development, proposed by the Soviet Union, of a comprehensive plan for protecting the environment of the North.

12809/12223

UDC 621.355

#### Study of Auto-Discharge of Nickel-Zinc Batteries

18410248b Leningrad ZHURNAL PRIKLADNOY KHIIMII in Russian Vol 61, No 1, Jan 88 (manuscript received 29 May 86) pp 67-71

[Article by V.E. Dmitrenko, M.S. Zubov, L.N. Kuznetsov, N.I. Okhlobystin, B.M. Toguzov, and Yu.V. Tikhomirov]

[Abstract] The conditions of self-discharge of the zinc electrode have been examined in studies on self-dis-

charge in nickel-zinc batteries. Cermet nickel oxide and zinc electrodes interact with one another. Nickel, contaminating the zinc electrode, increases its self-discharge, while zincate ions, formed during discharge of the zinc electrode, contaminate the cermet nickel oxide electrode. A recent study shows that hydrogen and oxygen are emitted during storage of charged nickel-zinc batteries. The purpose of the present work was to study self-discharge of nickel-zinc batteries while controlling the composition of the gases given off. The study was conducted at room temperature on prototypes having two layers of cellulose hydrate separator on the zinc electrodes and a capron separator on the cermet nickel oxide electrode. The active mass ratio of negative and positive electrodes was 2.5. The prototypes were filled with standard zincate electrolyte in an amount of 1.6 ml/A (hr) for zinc and configured with cycles of 0.9 mA/cm<sup>2</sup> at a discharge of 1.8 mA/cm<sup>2</sup>. After three control cycles, the batteries were tested for self-discharge. Self-discharge was then determined after 10 cycles with 5, 23, and 58 mA/cm<sup>2</sup> at intervals of 1, 3, 5, 10, 15, 20, and 30 days' storage times. Both zinc and cermet nickel oxide were found to contribute to discharge, and self-discharge is considerably greater than the losses in capacity due to emitted hydrogen. Zinc electrode corrosion from hydrogen evolution increases with battery usage. During storage of a charged nickel-zinc battery, nitrogen is evolved in addition to hydrogen and oxygen, and the resultant nitrate ions accelerate self-discharge of the battery. Figures 3; references 17; Russian.

12765

#### **Environmental Protection In Connection with Plant Retooling in Ferrous Metallurgy**

*18410315c Moscow KOKS I KHIMIYA in Russian  
No 3, Mar 88 pp 58-60*

[Article by Ye.I. Iksanova, Ferrous Metallurgy Information Service, from papers presented at the All-Union Scientific-Engineering Conference]

[Abstract] The author reports environmental protection measures proposed and described at the September 1987

conference in connection with the decree of the USSR Council of Ministers and CPSU Central Committee on improvements in ferrous metallurgy production and development. Retooling plans include the replacement of open-hearth furnaces by converters and electric steel smelting units, the introduction of dry quenching, and the direct reduction of exhaust gases. Antipollution measures that have been in use at some plants include wet scrubbers for removing sulfur dioxide from sintering gases, the installation of fluorine removal equipment, and pilot programs for the removal of carbon monoxide. Two metallurgical plants are setting up ammonium catalytic reactors for reducing nitrogen oxide to elemental nitrogen, and new coke batteries are planned for smokeless and dust-free dry quenching, which will also reduce benzopyrene discharge. Dust-free coke-producing apparatus have been installed at the Kommunar and Altay Coke Chemical Plants. The Kommunar Plant has also introduced the continuous feeding of coke into quenching cars with improved exhaust hoods that provide for better aspiration. The Gubakin Coke Chemical Plant has installed a unit to remove ammonia from coke gas, resulting in the production of high-grade commercial yields of ammonium hydroxide. The Cherepovetsk Metallurgical Combine is using a two-stage coke wetting process designed by the Energostal Scientific Production Association to prevent dust formation during crushing and quenching processes. Biochemical decontamination units are also being used at some coke chemical plants, and more are planned. The use of return water for quenching has been introduced at the Altay Coke Chemical Plant. Despite the progress made in environmental protection, the conference noted a number of inefficient antipollution operations and equipment that have been poorly designed by some of the industry's research and design institutes.

6289

**Encapsulation of Mineral Fertilizers in Polystyrene Derivatives Containing Hydrophilic Groups in Polymer Chain**

18410318a Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 61, No 3, Mar 88 (manuscript received 10 Mar 87) pp 468-471

[Article by Ya.I. Rustamov, A.V. Ragimov, G.A. Karamedov, S.S. Orudzhev, K.A. Aslanov, A.M. Kuliyev, R.Sh. Teymurova, and A.A. Shteyn, Chloroorganic Synthesis Institute, Azerbaiydzhan Academy of Sciences]

[Abstract] Ammonium nitrate and superphosphate fertilizers were coated by spraying with 10, 15, and 20 percent aqueous solutions of polystyrene derivatives containing hydrophilic groups in the polymer chain. The rate of dissolution of coated fertilizers in soil water was

found to increase with the number of hydrophilic groups in the polymer chain and decrease with the coating thickness. The coating thickness increases with the concentration of the polymer solutions and is greater on ammonium nitrate granules than on superphosphate granules. A twofold increase in the concentration of the solution results in 1.5- and twofold increases in the ammonium nitrate and superphosphate granules respectively. Any further increase has a negative effect on the evenness of encapsulation, however. Equations are reported for calculating the percentage of elementary chains substituted by hydrophilic groups and for calculation of coating thickness. References 7: 5 Russian, 2 Western.

12973

**Modification of Surface of Red Glow Phosphors**  
*18410297b KHIMICHESKAYA TEKHNOLOGIYA in Russian No 2, Mar-Apr 88 (manuscript received 18 Mar 86) pp 66-70*

[Article by N.I. Smirdova, R.A. Lyakh, T.V. Smityukh, and N.P. Yefryushina, Physical Chemistry Institute, UkrSSR Academy of Sciences, Odessa]

[Abstract] Phosphors with the surface of the grains covered with a pigment layer, which corrects the emission spectrum, are used in the production of color television picture tubes. Red ferric oxide pigment, which absorbs the short-wave radiation with a wavelength less than 55-580 nm and significantly reduces its reflection while insignificantly reducing the useful red radiation, usually is used for pigmentation of red glow phosphors. This article describes a study of the feasibility of increasing chemical stability and improving optical characteristics of red glow pigmented phosphors in comparison with those produced by the usual method of combined processing of the phosphors with fluorine-containing and silicon-containing reagents before pigmentation. The study used phosphors based on yttrium oxide and yttrium oxysulfide, activated by europium ( $Y_2O_3\text{-Eu}$ ,  $Y_2O_2\text{-Eu}$ ), type K ferric oxide pigment, acidic ammonium fluoride, sodium silicate (meta) and sodium phosphate (pyro), and potassium bichromate of extreme or analysis quality purity. For pigmentation, we suspended 10 g of phosphor in 20 ml of water and added a mixture of solutions of ammonium bifluoride and sodium metasilicate and then introduced the  $Fe_2O_3$  suspension into the sodium phosphate (pyro) solution (3 mmole/l), mixed it for 20 minutes, separated the pigmented phosphor by filtration, and, after washing it in 10-15 ml of water, dried it to dust at 100-120 degrees C. The optimum quantity of ferric oxide for modification of the hydroxysulfide phosphor was established. The effect of silicon and fluorine compounds on the quality of the pigmented phosphor was discussed. Treatment of the phosphor with a freshly-prepared mixture of sodium metasilicate and phosphorus-containing reagents increased the chemical stability of the pigmented luminescent composites and the adhesive strength of the pigment compared to those treated with a solution of reactive sodium silicofluoride. Optimum quantities of silicon and fluorine were determined. This method of modification may be used for surface processing of other luminescent composites. Figures 3; references 9(Russian).

02791

**Effect of Gamma-Radiation on Photoelectric and Acoustic Characteristics of GaAs**  
*18410299b Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR: SERIYA FIZIKO-TEKHNICHESKIKH, KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian (manuscript received 28 Jan 86) No 1, Jan-Feb 88 pp 75-77*

[Article by Ya.A. Agayev, G. Garyagdyev, V.V. Dyakin, A.P. Zdebskiy, and Kh. Rakhimov, Turkmen Polytechnical Institute]

[Abstract] A combined study of changes in spectra of stationary photoconductivity and acoustic characteris-

tics of GaAs single crystals under  $\gamma$ -radiation from a  $^{60}Co$  source at room temperature (dose—approximately  $10^9$  R) used samples of p-type GaAs with a specific resistance  $\rho$  of approximately  $10^7$  to  $10^8$  Ohm cm (300 K). A long-wave shift was attributed to an increase in "tails" of state density due to the formation of complexes based on primary radiation-induced defects. A long-wave shift in the maximum of the photoconductivity spectrum itself was attributed to the formation of spatial heterogeneity under the effect of  $\gamma$ -irradiation and the resultant appearance of rather strong local electric fields, that is, the Franz-Keldysh effect. Figure 1; references 8 (Russian).

02791

**Journal: Chemistry in Microelectronics (Chemical Precipitation from Liquid Phase)**

*18410307 Moscow KHIMIYA: KHIMIYA V MIKROELEKTRONIKE (KHIMICHESKOYE OSAZHDENIYE IZ GAZOVVOY FAZY) in Russian No 4, Apr 88 pp 1-4*

[Table of contents, annotation, and excerpts from introduction to journal, "Chemistry: Chemistry in Microelectronics (Chemical Precipitation From Gas Phase)," by Eduard Grigoryevich Rakov and Vladimir Viktorovich Teslenko, Moscow, Znaniye, 28,849 copies, 48 pages]

**[Excerpts]**

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#### Annotation

Is it possible to fabricate microcapsules from the most refractory but brittle metal or obtain refractory fibers, and finally, apply a dense coating to fine parts of microcircuits? It is virtually impossible to do this by traditional methods, but such problems can be solved successfully by the method of precipitation from the gas phase. The method essentially involves the implementation of a heterogeneous chemical reaction on the surface of a backing, resulting in the formation of a solid coating on this surface.

#### Introduction (Excerpts)

Chemical technology is, more and more, penetrating into different branches of industry and is bringing about revolutionary transformations in mining and metallurgy as well as in electronics and electrical engineering. In essence, there is not a single field of human activity in which materials that have passed through the hands of chemical engineers are not in use.

In chemical technology use is most frequently made of strictly chemical, physicochemical, and physical (especially mechanical) processes. However, traditional methods are constantly being supplemented by new methods. Some of the "recruits" are rather active and have acquired extensive areas of application in literally a few years.

Chemical precipitation from the gas phase is among such processes. This, in fact, is not a single process, but a group of processes based on different chemical reactions with different mechanisms and with a wide range of initiation methods.

We will try to give a definition of what chemical precipitation from the gas phase means. The basis for the process is reactions of volatile compounds that result in the formation of solid substances (precipitates) covering some surface. In the recently published Chemical Encyclopedic Dictionary preference was given to a somewhat different definition, according to which this process involves "obtaining solid chemical elements or compounds by using chemical reactions in which gaseous substances participate."

The principal merits of the method of precipitation from the gas phase in comparison with traditional methods are as follows:

- low temperatures for obtaining refractory substances;
- high precipitation rates;
- possibility of regulating precipitation rate;

—possibility of regulating form and structure of precipitates;

—high purity of resultant precipitates;

—low quantity of wastes and possibility of full utilization of valuable components;

—definite universality of method.

What has been said is confirmed, for example, by the fact that the most refractory metal, tungsten, which has a fusion point of 3420°C, can be obtained at 500-700°C, and by using some process activation methods, at temperatures close to room temperature. Whereas tungsten can also be segregated by another method, by electrolysis from melts, the most refractory nonmetal, carbon (with a fusion point under pressure of 3800°C), cannot be obtained in this way, but the chemical precipitation of graphite or pyrocarbon readily transpires at temperatures of about 1,000-1,500°C.

The rates of growth of precipitates may attain 1 to 5 mm/hr, which is 1 to 2 orders of magnitude greater than attainable in electrolysis from melts. A change in conditions, for example, temperature, pressure, concentration of reagents, rate of gas flow, activation power, and others, makes it possible to regulate the rate of growth of precipitates in a wide range.

By means of chemical precipitation from the gas phase, and this is the main feature and most important merit of the method, it is possible to obtain precipitates of the most different form, depending on the form of the surface (backing) to be covered. Gases, in contrast to fluid and especially solid substances, have a high mobility and easily reach any point of such a backing, which also makes it possible to obtain precipitates in the form of thin films of a complex geometry, capillaries, tubes, cones, spheres, and in principle, bodies of any configuration. It is only sufficient to impart this configuration to the backing to ensure its uniform heating and a uniform gas flow around the backing.

Monocrystalline fibers (so-called whiskers) are segregated by the described method, as are two-dimensional structures, epitaxial, semicrystalline, or amorphous films and coatings, and three-dimensional monocrystals.

Many reactions used for chemical precipitation from the gas phase transpire only under definite conditions. Accordingly, if the initial reagents also contain impurities, many of these impurities do not pass into the precipitate. In addition, the good volatility of the reagents makes it possible to carry out their thorough purification by reliably mastered methods. In such cases it is convenient to introduce a small number of very pure reagents, which simplifies the regeneration of the excess of reagents and the trapping and neutralization of harmful impurities from the escaping gases.

The universality of the method is determined by the broad range of substances produced. Among these are simple substances, alloys, oxides, nitrides, silicides, borides, carbides, and complex compounds. In contrast to electrochemical precipitation, chemical precipitation is also applicable for nonconducting materials. The method is suitable for obtaining multilayer coatings and structures (for which it is usually sufficient to change the composition of the gases) and for producing homogeneous powders and pulverized coatings. It can be used for chemical welding of parts made from refractory metals and alloys, for making ceramic parts denser and stronger, and for many other purposes.

Chemical precipitation from the gas phase in many cases is combined with chemical transport reactions, although these are different processes. Chemical transport transpires due to a reversible chemical reaction that, at certain temperatures, is sometimes accompanied by the expenditure of solid matter or, at other temperatures, by its repeated segregation. Here, accordingly, there are two temperature zones in the same reactor: with the initial solid substance and with the same matter, in a purer form, or in a different form (coating, monocrystal). The transport is by means of intermediate gaseous matter or substances that are not expended in the process.

Transport reactions transpire in closed systems, whereas precipitation from the gas phase transpires in open systems, most frequently in a flow. On the one hand, chemical precipitation from the gas phase can be a part of the transport reactions and transpire in a zone where solid matter is segregated, although in actuality the field of its occurrence is somewhat broader.

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5303

Oxygen Partial Pressure-Temperature Phase Diagram of Barium-Yttrium Cuprite  $\text{YBa}_2\text{Cu}_3\text{O}_{9-y}$ ,  
18410314c Kiev DOKLADY AKADEMII NAUK  
UKRAINSKOY SSR: SERIYA B.  
GEOLOGICHESKIYE, KHIMICHESKIYE I  
BIOLOGICHESKIYE NAUKI in Russian No 3, Mar 88  
(manuscript received 21 Oct 87) pp 59-62

[Article by V.V. Prisedskiy, Ye.M. Royzenblat, I.A. Udomov, L.G. Gusakova, and V.V. Klimov, corresponding member, Ukrainian Academy of Sciences, All-Union Scientific Research Institute of Reagents and Chemically Pure Materials for Electronics, Donetsk]

[Abstract] The properties of the high-temperature superconductor  $\text{YBa}_2\text{Cu}_3\text{O}_{9-y}$ , including its possibility for transition to a superconducting state, are highly dependent on the oxygen content. Both compounds, which are anion-deficit in structure, can contain considerably more oxygen than is required by stoichiometry for bivalent copper, which led to the prevalent idea of a key role of

$\text{Cu}^{2+}$  ions in the formation of high-temperature superconductivity. Many uncertainties persist in this respect, but various authors have assigned specific values to the oxygen content in the "1/2/3" phase. A study was therefore conducted to determine the content and state of oxygen in  $\text{YBa}_2\text{Cu}_3\text{O}_{9-y}$  and for constructing its partial pressure-temperature phase diagram, which reflects the equilibrium conditions for existence of a phase with a given oxygen content. The relative changes in the molar content of oxygen were computed directly from gravimetric data. In calibrating the data the absolute oxygen content was determined from the change in mass with full reduction of the samples to metallic copper. The position of the low-oxygen limit of the homogeneity of barium-yttrium cuprite was determined, and the partial enthalpy of oxygen was computed. It was found that oxygen exists in  $\text{YBa}_2\text{Cu}_3\text{O}_{9-y}$  in two forms, one of which is poorly bound to matter, partially replaced by other gases, and released when dissolved in acids. The results of a full chemical analysis are given in a table. The content of the other firmly bound form of oxygen is constant; the variable part is completely poorly bound oxygen. A formula is derived for composition of "1/2/3" phase. The intercalation of oxygen occurs on the (001) base planes; it is logical to assume that the  $\text{Cu}^{2+}$  ions are also in the (001) planes. A formula is derived that possibly defines the mechanism of high-temperature superconductivity. The question of the upper oxygen content limit remains open. A full populating of the oxygen nodes in the base planes corresponds to  $x = 2$ , but it is unknown whether such contents are actually attainable. It is clear, however, that to achieve a good superconductivity a high oxygen content ( $x$  about 1) is necessary. Figures 2; References 9: 3 Russian, 6 Western.

5303

#### Study of Solid Solutions $\text{LaCo}_{1-x}\text{Ti}_x\text{O}_3$

18410191a Moscow ZHURNAL  
NEORGANICHESKOY KHIMII in Russian Vol 32, No  
11, Nov 87 (manuscript received 11 Jul 86)  
pp 2789-2793

[Article by I.F. Kononyuk, S.P. Tolochko, N.G. Surmach, T.P. Nikitina, and I.M. Tarnovetskiy]

[Abstract] When cobalt is partly replaced with titanium in  $\text{LaCoO}_3$ , perovskite solid solutions of  $\text{LaCo}_{1-x}\text{Ti}_x\text{O}_3$  are formed when O lies between 0 and 0.5. A nonstoichiometric lanthanum titanate having a perovskite structure  $\text{La}_{2/3}\text{TiO}_3$  has been prepared at reduced partial pressures of oxygen and even in air at temperatures between 1,670 and 1,720 K. Doping the latter at the lanthanum sublattice with ions of alkali or alkaline earth metals results in decreased stoichiometry and increased stability of the titanate. Therefore, it may be assumed that nonstoichiometric solid solutions having a perovskite structure may also be formed in the system  $\text{LaCoO}_3$ - $\text{La}_{2/3}\text{TiO}_3$ . This article reports a study that examined the preparation conditions, formation thresholds, limits of the nonstoichiometry of defect structures, and electrical

conductivity of solid solutions of  $\text{LaCo}_{1-x}\text{Ti}_x\text{O}_3$ . The values for  $x$  ranged from 0.2 to 0.7;  $y = 0$  to 0.23, and  $O - \delta$  to 0.25. It was established that the concentration of vacancies in the octahedral sublattice does not exceed 1 to 2 percent. The upper threshold of lanthanum content corresponds to the filled oxygen sublattice ( $\delta = 0$ ), and the lower threshold agrees approximately with the ratio  $x\text{La}_{2/3}:(1-x)\text{LaCoO}_3$  with an almost complete reduction of  $\text{Co}^{+2}$  ions to  $\text{Co}^{+2}$  when  $x$  is equal to or greater than 0.5. Electrical conductivity of the solid solutions at 373 K decreases by eight orders of magnitude as  $x$  increases from 0.2 to 0.7. Figures 2; references 12: 5 Russian, 7 Western.

12765

**Thermodynamic Properties of Zinc Metaarsenate**

*18410192 Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHASKOY SSR: SERIYA KHIMICHESKAYA in Russian No 6, Nov-Dec 87 (manuscript received 5 Jun 85) pp 8-11*

[Article by B.K. Kasenov, M.Zh. Makhmetov, V.O. Bukharitsyn, Yu.M. Kuznetsov, and R.B. Shashchanova, Chemical and Metallurgical Institute, KaSSR Academy of Sciences, Karaganda]

[Abstract] One of the problems facing metallurgy and chemical engineering is the elimination of arsenic from ores and ore concentrates in nonferrous metallurgy. The difficulty in solving this problem lies in the lack of data on the physicochemical properties of arsenic compounds, which are essential for the theoretical fundamentals of an engineering process. In the present work, the standard heats of formation, entropy, and formulas for heat capacity as a function of temperature were determined for zinc arsenate. The resultant values for heats of formation were in agreement with the second and third laws of thermodynamics. References: 12 Russian.

12765

UDC 541.123.3(546.654+546.56+546.22)

 **$\text{Cu}_2\text{S}-\text{La}_2\text{S}_3$  System**

*18410341b Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 33, No 4, Apr 88 (manuscript received 19 Dec 86) pp 991-995*

[Article by O.V. Andreyev, Tyumen State University]

[Abstract]  $\text{La}_2\text{S}_3$  is promising as a material for optical ceramics. Its low-temperature modification has a rhombic lattice, while  $\beta\text{-La}_2\text{S}_3$  has a tetragonal lattice and

$\gamma\text{-La}_2\text{S}_3$  has a cubic lattice. This article constructs the state diagram of the system  $\text{Cu}_2\text{S}-\text{La}_2\text{S}_3$  by using physical chemistry analysis methods to study the relationships between composition and properties. Complex chemical reactions occur in the system, forming the trinary phase  $\text{CuLaS}_2$  and limited solid solution areas. The results obtained prove that no possible version of the phase containing 66.67 mol. percent  $\text{La}_2\text{S}_3$  occurs. The trinary phase melts incongruently at 1,471 K. Figures 4, references 11: 5 Russian, 6 Western.

6508

UDC 541.123.3(546.654+546.56+546.22)

**Possibility of Replacing Molybdenum Atoms in  $\text{Mo}_6$  Cluster in  $\text{Mo}_{6-y}\text{I}_{2-x}$** 

*18410341c Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 33, No 4, Apr 88 (manuscript received 30 Jul 86) pp 1046-1047*

[Article by I.G. Semenova, Ye.A. Pisarev, and D.V. Drobot, Moscow Institute of Fine Chemical Technology imeni M.V. Lomonosov]

[Abstract] Materials having the general formula  $\text{M}_x\text{Mo}_6\text{X}_y$ , where  $\text{M}$  is a metal and  $\text{X}$  is a chalcogen, have the cluster group  $\text{Mo}_6\text{X}_y$  and can be conveniently described by the number of valence electrons per cluster (VEC). Superconducting compounds have between 20 and 23 VEC, whereas  $\text{Mo}_{6-y}\text{I}_{2-x}$  has 22. This article studies how the change in the VEC in  $\text{Mo}_{6-y}\text{I}_{2-x}$  influences the superconductivity of this phase. The VEC is changed by replacing some of the Mo atoms in the cluster with other metals. In this article, the molybdenum atoms in the cluster are replaced with niobium, rhenium, and tungsten to change the number of d electrons in the  $\text{Mo}_6$  cluster, and their influence on superconductivity is studied. The replacement metals were selected because of the similarity of their chemical and crystal chemical properties with molybdenum. Compositions sought in the experiments were:  $\text{Mo}_{6-z}\text{M}_z\text{S}_{6-y}\text{I}_{2-x}$  (where  $Z = 0-1$ ,  $M = \text{Re, Nb, W}$ ) and  $\text{Mo}_4\text{M}_2\text{S}_{6-y}\text{I}_{2-x}$ ,  $\text{Mo}_2\text{M}_4\text{S}_{6-y}\text{I}_{2-x}$ . The studies showed that introducing niobium, rhenium, or tungsten at 0.1 atomic percent or more resulted in the disruption of the cluster and prevented the production of single-phase specimens under the synthesis conditions studied. References 2: Russian.

6508

**Study of Effect of Discharge Conditions on Characteristics of N<sub>2</sub>O Gasdynamic Laser**  
*18410263b Novosibirsk FIZIKA GORENIYA I VZRYVA in Russian No 1, Jan-Feb 88 (manuscript received 27 Mar 86) pp 61-65*

[Article by A.B. Britan, Yu.I. Grin, V.V. Golub, I.A. Orayevskiy, V.G. Testov, and A.N. Khmelevskiy, Moscow]

[Abstract] Improvement of nitrous oxide gas dynamic lasers by raising the amplification-medium temperature is frequently hindered by the low decomposition temperature (about 1,600 K) of nitrous oxide. In this case optimizing the nozzle geometry is a promising method of raising the lasers' characteristics. Five nozzles (four wedge shaped and one graded) with cone angles of 30 or 50 degrees were tested for this purpose. One nozzle was equipped with a tube plate in the critical cross section. The results can be used to evaluate the flow inversion characteristics and to optimize and predict the nitrous oxide laser characteristics. Generally speaking, using a channel behind the nozzle exit section increased the gain factor and reduced its attenuation along the length of the flow. References 7, all Russian.

12973

**Synthesis and Spectral-Luminescent Properties of Dibenzo[b,i]phenoxazine and Some of Its Derivatives**

*18410293d Riga KHIMIYA GETEROTSIKLICHESKIKH SOYEDINENIY in Russian No 2, Feb 88 (manuscript received 14 Aug 86; after revision 15 Dec 86) pp 262-267*

[Article by L.Ye. Marinina, V.I. Alekseyeva, L.P. Savvina, and Ye.A. Lukyanets, Scientific Research Institute of Organic Intermediates and Dyes, Moscow]

[Abstract] Phenoxazine derivatives, particularly oxy- and aminophenoxyazines, which are effective red luminescophors, are widely used as generating compounds in wide-band tuned lasers. The authors have previously shown that 3,6-dinitrophenoxazine also has luminescence in alkaline alcohol solutions, with a maximum wavelength at 760 nm. This may be explained by its deprotonation with the formation of a balanced anion, a phenoxazine dye analogue, but with a negative charge in the molecule. This article describes a study of condensed phenoxazine analogues, particularly its linearly annelated analogue, dibenzo[b,i]phenoxazine, describing the synthesis and spectral luminescence properties of the compound and a number of its derivatives. Reference 11: 5 Russian, 6 Western.

6508

**Radiation-Stimulated Diffusion of Oxygen in Aluminum-Yttrium Garnet Monocrystal AYG:Nd<sup>3+</sup>**

*18410302c Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 2, Feb 88 (manuscript received 28 Apr 87) pp 564-567*

[Article by V.M. Garmash, G.A. Yermakov, Yu.P. Konstantinov, V.M. Lyubchenko, V.V. Gromov, N.Yu. Konstantinov, and L.G. Karaseva, Physical Chemistry Institute, USSR Academy of Sciences, Moscow]

[Abstract] None of the coloration centers in both the  $\gamma$  and UV radiation in aluminum-yttrium garnet [AYG] is the F\* center, an electron in an anion vacancy whose spectral and energy characteristics have been studied previously. Since the optical spectrum of the F\* center involves both the range of excitation and that of the generation of laser radiation in AYG:Nd<sup>3+</sup>, it is important to be able to diminish the absorption resulting from F\* centers. In the existing AYG monocrystals there are between 10<sup>-3</sup> and 10<sup>-2</sup> percent anionic vacancies and uncontrolled impurities, some of which help stabilize F\* centers. The most effective method of reaching this goal is by heating the AYG crystals in oxygen at high temperatures when oxygen diffuses into the crystal lattice of AYG and occupies the available vacancies. This O<sub>2</sub> diffusion was studied in the 1,000 to 1,500°C temperature range by using the radiothermoluminescence method. It was shown that in a field of ionizing  $\gamma$ -radiation the coefficient of oxygen diffusion in AYG was six orders of magnitude higher than the strictly thermal diffusion coefficient in the same matrix. Figures 3; references 12: 7 Russian, 5 Western (1 by Russian authors).

7813

**Recombination of CF<sub>3</sub>, C<sub>2</sub>F<sub>5</sub>, and C<sub>3</sub>F<sub>7</sub> in Argon**  
*18410317d Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: SERIYA 4, FIZIKA, KHIMIYA in Russian No 1, Feb 88 (manuscript received 19 Jun 86) pp 30-37*

[Article by G.A. Skorobogatov, O.N. Slesar, and N.D. Torbin]

[Abstract] In the photodissociation of gaseous iodides RI, a series of reactions of the R radical play a decisive role among the dark reactions. The overlapping relaxation method was proposed and developed by G.A. Skorobogatov and others (VESTN. LENINGR. UN-TA, No 4, 1975; DOKL. AN SSSR, Vol 231, 1976) for measuring the rate constants of these reactions over a wide range of changes in temperature T and concentration X of the inert diluent. The method yielded experimental data on the dependence of the rate constants for the aforementioned reactions on temperature for the radicals CF<sub>3</sub>, C<sub>2</sub>F<sub>5</sub>, C<sub>3</sub>F<sub>7</sub>, and others, and a study was made of the reactions of the R radical, developing as a result of photolysis of a gaseous iodide diluted by large

argon excess. The experimental apparatus and gas chromatography analysis method for starting compounds and end products described in an earlier study were used in studying  $\text{CF}_3\text{I}$ ,  $\text{C}_2\text{F}_5\text{I}$ , and  $\text{C}_3\text{F}_7\text{I}$  in mixtures with extremely pure helium or argon. The second-order reaction rate constants were measured at the high-pressure limit for the recombination of these radicals and for recombination of these radicals with  $\text{I}(\text{P}_{3/2})$  and  $\text{I}(\text{P}_{1/2})$  atoms. For the radicals studied, with transition from the inert diluent Ar to the diluent He, the activation energies decreased by several times. A table gives a full picture of experimental data on activation energies for reactions of the R radical for  $\text{X} = \text{He}$  and  $\text{X} = \text{Ar}$ . The non-negative activation energies are an objective, not subjective property of these reactions. Figures 2; references 22: 15 Russian, 7 Western.

5303

**Measuring Electron Density in Pulse Cross Section in He:Xe:HCl Mixture with High Time and Space Resolution**

18410317f Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: SERIYA 4, FIZIKA, KHIMIYA in Russian No 1, Feb 88 (manuscript received 5 Feb 86) pp 80-83

[Article by I.O. Blinov, A.A. Pastor, P.Yu. Serdobintsev, and N.N. Shubin]

[Abstract] The kinetics of electric-discharge excimer XeCl lasers is determined largely by processes with the participation of electrons. For example, the rate of generation of excimer molecules as a result of the harpoon reaction is limited by processes of electron excitation of xenon atoms, and the contribution of the alternative reaction of the population of the upper laser level, ion-ion recombination, is largely dependent on the formation rate of negative chlorine ions during the dissociative attachment of electrons to HCl molecules. Then the predominance of ionization multiplication of electrons over their volumetric losses in an active medium results in the development of instabilities. However, at present the relative role of the harpoon reaction and ion-ion recombination in the formation of XeCl<sup>\*</sup> molecules in an independent discharge in electric-discharge lasers is unclear. Earlier (A.A. Pastor, et al., VESTN. LENINGR. UN-TA, No 4, 1985) the authors measured concentrations of excited Xe atoms and ions and negative Cl ions in an excimer XeCl laser with nanosecond time resolution, and it was concluded that ion-ion recombination has a predominant role in the formation of XeCl<sup>\*</sup> molecules. However, a full comprehension of the process requires a knowledge of temporal variation of the electron concentration. The interferometric method was used to measure the electron concentration in the studied discharge. The article gives a diagram of the apparatus used in the measurements. Radiation was measured simultaneously at two wavelengths: 460 and 560 nm. The interference patterns at two wavelengths for different times relative to onset of the discharge was

photographed and then processed for obtaining data on the time dependence of electron concentration on the discharge axis. Measurements of the temporal variation of electron density indicate that the dominant electron loss process in a discharge is dissociative attachment with subsequent ion-ion recombination. The dynamics of the unevenness in electron density during the discharge period is investigated. Virtually all the positive Xe ions appearing at the first pulse peak are transformed into excimer molecules after about  $10^{-8}$  s.

5303

**Reactions of 3d-Transition Metal Difluorides with Rare Earth Metal Trifluorides**

18410191b Moscow ZHURNAL NEORGANICHESKOY KHIMII in Russian Vol 32, No 11, Nov 87 (manuscript received 13 Mar 87) pp 2797-2799

[Article by V.S. Sidorov, M.B. Ikrami, and N.I. Kuznetsova, Institute of Chemistry imeni V.I. Nikitina, TASSR Academy of Sciences]

[Abstract] Difluorides of 3d-transition metals (Mn, Fe, and Co) having rutile structures are interesting for their magnetic properties as antiferromagnetics, while nickel fluoride is a weak ferromagnetic. The trifluorides of rare earth metals are widely used as doping agents for laser matrices. Sensitized luminescence has been observed on magnetically ordered crystals doped with rare earth metal ions in certain materials, such as manganese fluoride crystals doped with Eu, Ho, and Nd ions. Fluorides of transition elements doped with rare earth elements are also interesting as materials for quantum electronics. In the present work, phase diagrams of binary systems of manganese, iron, and cobalt difluorides with rare earth element trifluorides were studied, and the relationship between the non-variant equilibrium coordinates and the ionic radius of  $\text{Ln}^{3+}$  was determined. Phase equilibrium coordinates of the systems were calculated since their experimental study presents difficulties. Figures 1; references 11: 7 Russian, 4 Western.

12765

UDC 539.193+539.27

**Molecular Structure of of Rare Earth Element Trihalides Based on Electronographic and Spectral Data**

18410343a Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 4, Apr 88 (manuscript received 23 Jul 87) pp 883-895

[Article by Ye.Z. Zasorin, Moscow State University imeni M.V. Lomonosov, Chemistry Department]

[Abstract] Rare earth element compounds are widely used in laser optics. Studies of the molecular structure of rare earth element trihalides are also important to theoretical inorganic chemistry by virtue of the specific

properties of the electron shells of lanthanide atoms. This article analyzes results of electronographic and spectral studies of rare earth trihalides by using improved methods that make it possible to refine certain internuclear distances and oscillation amplitudes. Holmium, gadolinium, and praseodymium trifluorides were studied by electronographic methods for the first time. The following parameters were obtained for all of the compounds studied: their thermally average characteristics, their equilibrium geometric configurations, and

their force constants (estimated in a harmonic approximation). The calculated oscillation frequencies were compared with literature data. Regular changes in structural parameters were found in rare earth element trihalides, clarifying previous internuclear distances of elements in rare earth trihalide molecules that have not been experimentally studied. Figures 2, references 56; 30 Russian, 26 Western.

6508

UDC 541.49:546/562+47+74+712+73+547.466

**Heteroligand Complexes of Biometal Ions With L-Tryptophan and Adenosine-5'-Phosphates**

18410341a Moscow ZHURNAL

NEORGANICHESKOY KHIMII in Russian Vol 33,

No 4, Apr 88 (manuscript received 15 Dec 86)

pp 977-982

[Article by P.A. Manorik, Ye.I. Bliznyukova, and M.A. Fedorenko, Institute of Physical Chemistry imeni L.V. Pisarzhevskiy, Ukrainian Academy of Sciences]

[Abstract] Tryptophan, an unsubstituted amino acid, is an important metabolite or precursor for the synthesis of many substances including serotonin. The indole group of tryptophan is the locus of synthesis of many substrates in enzyme active centers by the stacking reaction with the substrate molecules. This article studies the composition and stability of complexes with various ligands formed in mixed-ligand systems containing the dichlorides of copper, nickel, zinc, cobalt, manganese, magnesium and calcium, L-tryptophan, and adenosine-5'-phosphates, including adenosine tri-, di-, and

monophosphates (ATP, ADP, and AMP, respectively). The stability of the complexes studied varies in the Irving-Williams sequence and increases with increasing nucleotide phosphate chain length from AMP<sup>2-</sup> through ADP<sup>3-</sup> to ATP<sup>4-</sup>. It is concluded that one main factor determining the stability of the biometal complexes with tryptophan and ATP is the properties of the tryptophan side group, particularly its hydrophobicity, as well as the nature of the metal ion. The reason for the increased stability of M(Trp)<sub>2</sub> complexes in comparison to other amino acid complexes may be the hydrophobic interaction of the two indole groups of tryptophan in M(Trp)<sub>2</sub> complexes since the hydrophobic reaction in an aqueous solution is accompanied by an increase in entropy plus an increase in the absolute enthalpy due to the water lattice hydrogen bond breaking that occurs. The electron structure of the metal ion and its dimensions and coordination polyhedron symmetry encourage placement of ligands such that certain conformations are fixed, stabilized by intramolecular reactions that are impossible or very weak without the ion. Figures 2, references 29: 11 Russian, 18 Western.

6508

**Substituted Phosphorylamido Phosphates**

18410189b Moscow *IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA* in Russian No 11, Nov 87 (manuscript received 10 Apr 86) pp 2547-2550

[Article by A.A. Khobak, N.A. Tikhonina, Yu.N. Porshnev, and V.A. Gilyarov, Institute of Elemental Organic Compounds imeni A.N. Nesmeyanov, USSR Academy of Sciences, Moscow]

[Abstract] The complete esters and amides of phosphorylamido phosphoric acids have herbicidal and defoliating activity. To find new pesticides, a broad search was made of the phosphorylamidophosphate series having an aroxyl, phenyl, or trifluoroethoxyl group at the phosphoryl group. Twenty-nine compounds were prepared in the present work. Diarylamido phosphates were treated with phosphorus pentachloride to give O,O-diarylichloro(di-chloro phosphorylamido)phosphates. On hydrolysis, the latter were converted to diaroxy phosphorylamido phosphates. Tests showed that the compounds lacked herbicidal activity. References 3: 2 Russian, 1 Western.

12765

**Synthesis and Molecular Structure of O-Isopropyl Chloroformimino Diphenyl Phosphinate**

18410189c Moscow *IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHMICHESKAYA* in Russian No 11, Nov 87 (manuscript received 2 Dec 86) pp 2595-2597

[Article by I.V. Martynov, A.N. Chekhlov, A.N. Ivanov, T.A. Yepishina, V.D. Makhayev, and V.B. Sokolov, Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka]

[Abstract] It has been previously reported that diphenyl phosphinous acid reacts with 1,1-dichloro-1-nitrosoalkanes to form the corresponding O-alkyl chloroformimino diphenyl phosphinates. For the purpose of broadening the scope of this reaction, a study (reported in the present work) examined the reaction of diphenylphosphine with 1,1-dichloro-1-nitrosoisobutane, and an x-ray structural analysis was made of the resultant O-phosphoryl oxime. The molecular structure of phosphoryl oximes, which appear promising as a possible class of pesticides, has never been studied before. Diphenylphosphine was found to react with two equivalents of 1,1-dichloro-1-nitrosoisobutane to form O-isopropyl chloroformimino diphenyl phosphinate. Figure 1; references 2: 1 Russian, 1 Western.

12765

**New Heterocyclic System:**  
**Di[1,2,3-benzotriazolo[5,6-b; 5', 6'-k]]-18-crown-6**  
*18410293c Riga KHIMIYA*  
**GETEROTSIKLICHESKIKH SOYEDINENIY** in  
*Russian No 2, Feb 88 (manuscript received 23 Sep 86;*  
*after revision 26 Mar 87) pp 256-257*

[Article by E.I. Ivanov, A.A. Polishchuk, and P.B. Terentyev, Physical Chemical Institute imeni A.V. Bogatskiy, Ukrainian Academy of Sciences, Odessa]

[Abstract] Substituted dibenzo-18-crown-6 compounds are fungicides and plant growth regulators. Production of crown ethers with fragmentary inclusion of thiazole, imidazole, 2,1,5-oxadiazole, pyridine, pyrazine, pyrimidine, and 1,4-diazepine groups was recently described. The substances synthesized include some with ergotropic and bactericidal activity. This article describes a scheme for producing bis-triazole analogues of the crown ethers by interaction of a crown ether with an excess of hydrazine hydrate in DMSO at room temperature. The UV spectra of the compounds synthesized have three absorption bands at 238-242, 300-324, and 335-445 nm. References 8: 4 Russian, 4 Western.

6508

**Chromatographic-Enzymatic Method for Determining Residual Organophosphorus Pesticides in Foodstuffs and Environmental Samples**

*18410301d Moscow ZHURNAL ANALITICHESKOY KHMII in Russian Vol 43, No 2, Feb 88 (manuscript received 5 Nov 86) pp 354-359*

[Article by M.A. Klisenko and M.V. Pismennaya, All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers, and Plastics, Kiev]

[Abstract] The insecticidal activity of organophosphorus pesticides is based on their ability to phosphorylate esterases, thereby inhibiting their functions. This action is related to the specific activity and concentration of organophosphorus pesticides. An analytical method was developed to determine residual organophosphorus pesticides. It is based on thin-layer chromatography of organophosphorus pesticides coupled with the biological determination of their ability to inhibit the activity of cholinesterase. Experimental results were reported, based on the analysis and identification of 33 organophosphorus pesticides found in foods and environmental samples. This method could detect from  $10^{-10}$  to  $10^{-9}$  g of organophosphorus pesticides, even in the presence of other pesticides. Chromatographic parameters were established for 33 organophosphorus pesticides. References 10: 6 Russian, 4 Western.

7813

**New Tariffs for Aerial Spraying in Agriculture and Forestry**  
*18410316c Moscow ZASHCHITA RASTENIY in Russian No 4, Apr 88 pp 49-52*

[Article by A.I. Pleshakov, section head, V.A. Kharchenko, sector head, and I.V. Mironov, scientific specialist, Krasnodar Branch, State Scientific Research Institute for Civil Aviation]

[Abstract] The Ministry of Civil Aviation, in collaboration with pertinent key organizations, has formulated new tariffs for aerial spraying work in agriculture and forestry which became effective in January 1988. These tariffs have changed repeatedly during the last 40 years. The best tariffs were probably those of 1948 (their structure included all 18 types of aerial spraying performed at that time). Later, attempts were made to simplify these tariffs with emphasis on the norm for expenditure of chemical agents per hectare. During the last 20 years, the operational expenditures of civil aviation have risen greatly due to increased costs for aircraft, spare parts, materials, fuel, wages, allocations for social security, and many other factors. This resulted in a constant worsening of the financial indices of aerial chemical work. All this has dictated a new revision of the tariffs. A series of tables gives a wide range of pertinent data on cost factors, such as the cost of one flight hour of aerial chemical work for different types of aircraft (An-2 and Mi-2 and Ka-26 helicopters) with a comparison between 1972 and 1986, a comparison of tariff indices of 1972 and 1987, and fees for processing 1 hectare from an An-2 aircraft for different types of aerial chemical work for different lengths of runs and different applications of chemicals per hectare for seven different categories of such work that have been defined in the new tariff schedule.

5303

**Current Problems in Plant Protection Service**  
*18410316b Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 88 pp 2-4*

[Article by V.I. Martynenko, first deputy chairman, "Soyuzselkhozkhimiya" Association: "To See the Goal and Reach It as Quickly as Possible"]

[Abstract] By rectifying the shortcomings in the plant protection service, it will be possible to greatly increase crop productivity despite the many successes that have been achieved in past years. More than a hundred research institutes are contributing to the solution of these problems, and thousands of personnel are working in laboratories, at stations, and in the field. But in many ways, their work is uncoordinated and insufficiently effective. The use of pesticides, for example, is often inefficient, and the methods for using them must be reexamined within the scope of an integrated approach to crop protection. It has been known for over a decade that lesser quantities of pesticides should be used, but

very little has been done in this direction. More and more insecticides and fungicides are being purchased abroad, without adequate research on application methods. There are no models that can be used in determining the meteorological conditions suitable for the onset of dangerous development and propagation of diseases, pests, and weeds. There is a shortage of adequate information on the life cycles of harmful organisms and the influence of external factors on them, but even when such data are available, they cannot be used due to a lack of computers and the special models required for developing plant protection systems. Recommendations must be drawn up on the detoxification of soils polluted by chemical plant protection agents, and an automated system must be developed for automatic collection, storage, and processing of data on the content of residues of toxic substances in products, soil, and wastewaters. Predictions of dangerous conditions are usually based on visual observations and logical models. Few mathematical models exist and are rarely used. The emphasis is on long-range predictions, and essential short-range predictions are relatively uncommon. Even the most important research institutes lack adequate computers, which greatly cripples their research efforts. There is a great need for radically restructuring the data collection and processing system. At the moment, chemical methods predominate in the integrated plant protection program, with too little attention being given to agroengineering and biological methods. There is much to be done in improving methods and equipment for the application of chemical agents.

5303

UDC 541.138

**Study of Acetone Chlorination Reactions by Electrolysis of Aqueous Solutions of Calcium Chloride**

18410245b Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 128, No 1, Oct 87 (manuscript received 26 Mar 87) pp 69-72

[Article by S.V. Dolidze, Yu.A. Yuzbekov, Kh.A. Maksimov and A.P. Tomilov, Institute of Inorganic Chemistry and Electrochemistry, GSSR Academy of Sciences; Institute of Chlorine Organic Synthesis, AzSSR Academy of Sciences]

[Abstract] Chlorine derivatives of acetone are used industrially. For example, monochloroacetone is used as a herbicide, while 1,1,3-trichloroacetone is used as a source material to prepare folic acid. The currently used method for producing chlorine derivatives of acetone has many shortcomings, one being the fact that for every mole of 1,1,3-trichloroacetone produced, 3 moles of hydrogen chloride are formed, which contaminates both the source material and the end product of the reaction. Furthermore, the use of molecular chlorine is undesirable from the ecological standpoint. To circumvent the use of molecular chlorine, an electrochemical method of acetone chlorination was developed. The method uses chlorine generated by the electrolysis of aqueous solutions of calcium chloride. Chlorination was conducted in a 500 ml-glass electrolyzer fitted with a 50-cm<sup>2</sup> cylindrical anode surrounding a 40-cm<sup>2</sup> cylindrical cathode suspended from a cover. Acetone was added through a hole in the cover to the electrolyte, and the gases emitted during the process were diverted through a water-cooled condenser to a vessel containing 10 percent aqueous potassium iodide as an indicator for the presence of chlorine in the off gases. During the electrolysis, hydrogen and chlorine are formed, with the latter being used for acetone chlorination. The results indicate that the process is best run in three stages, with a current density of 40-50 amperes per sq decimeter and an electrolyte temperature of 25-35 degrees C for the first stage, where primarily monochloroacetone and 10 percent 1,1-dichloroacetone are formed. The second stage should be conducted with a current density of 20-30 amperes per sq decimeter and an electrolyte temperature of 50-60 degrees. Chlorine derivatives formed in the first stage are converted into 1,3-dichloroacetone and a small amount of 1,1,1-trichloroacetone. To obtain the end product, 1,1,3-trichloroacetone, the reaction must then be run at 10-15 amperes per decimeter and 80 degrees C. This is due to the fact that the rate of chlorine formation at the anode exceeds that of chlorination process, and free chlorine would otherwise be emitted into the atmosphere (at higher current densities).

12765

**Increasing Petroleum Production Quality Under New Conditions of Management**

*18410297c Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 3, Mar 88 pp 4-6*

[Article by L.N. Shabalina, Z.M. Pishchayeva, R.I. Gay-sanyuk, and V.S. Yedigarova, Moscow Petroleum Processing Plant]

[Abstract] General measures introduced at the Moscow Petroleum Processing Plant in order to ensure a stable and reliable increase in production quality under new conditions of management were discussed briefly. Three special purpose programs for increasing the quality of the most important products (motor vehicle fuel, diesel fuel, and propylene), being developed with the Moscow Center of Standardization and Metrology, were discussed. Other measures discussed in this article were: development of technology for producing optimum quality motor vehicle gasolines, completion of auxiliary engineering installations, renovation and expansion of energy savings, technical reequipping, mechanization, and automation. Development and introduction into production, for the first time in the USSR, of processes for electrodeminerhalizing petroleum were discussed. New devices and procedures for increasing diesel fuel reserves were described. Introduction of some new control devices have increased the labor productivity of laboratory workers and reliability of analysis. Some of these devices were described briefly. Measures being taken to automate chromatographic analyses were discussed briefly. References 2: Russian.

02791

**Joint Soviet-American Enterprises in Western Siberia**

*18410345a Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 May 88 p 2*

[Article by TASS correspondent S. Turanov "Under the Sign of Mutual Profit"]

[Text] Large-scale joint Soviet-American enterprises will be organized in Western Siberia. An agreement was signed on 1 Jun in Moscow between the USSR Ministry of the Petroleum Refining and Petrochemical Industry and the American firms Combustion Engineering and McDermott on intentions and basic principles of construction in the cities of Surgut and Tobolsk of petrochemical complexes in the form of joint enterprises. At them, it is planned to organize large-capacity production of high-octane non-toxic gasoline additives, aromatic hydrocarbon products, olefins, and other petrochemical products.

"Our ministry is successfully developing cooperation with American firms," reported N.V. Lemayev, minister of the USSR Petroleum Refining and Petrochemical Industry. "Last year, the first joint Soviet-American enterprise was built for the production of facilities and

systems of automated control of industrial processes. This enterprise, built in Neftekmansk, will turn out the first production as early as June. And today, documents have been signed, relating to the building of enterprises, and capital outlays are estimated to be tens of billions of dollars. Petrochemical products produced in Western Siberia according to the latest technology will be exported to foreign markets and sold inside the country. It will promote scientific and technical progress in machine building, light industry, and other sectors of the national economy, and in the production of consumer goods. Western Siberia will be converted from a petroleum and gas-extracting region to a powerful industrial region.

"Production at enterprises will be organized according to advanced technologies using very efficient equipment and automated control systems, including those developed by Soviet institutes. A lot of work must be done this year on drawing up technical and economic analyses. And we plan to obtain the first production at the beginning of the next Five-Year Plan."

"It is noteworthy," remarked the minister, "that the agreement was signed in the days of the Soviet-American meeting at the highest level. It became a specific reinforcement of the development of cooperation in business between our countries."

V.K. Gusev and V.M. Kamentsev, deputy presidents of the USSR Council of Ministers participated in the ceremony for signing the agreement.

12410

**Condensate Pipeline from Uren to Surgut for Motor Fuel Production**

*18410345b Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Jun 88 p 1*

[Article by V. Melnikov and Nigmatullin, corresponding members to the USSR Academy of Sciences: "There Are No Analogs in the Competition for the USSR State Prize"]

[Text] We begin with a paradox: at the Tyumen North, equipment frequently stands idle because of a fuel shortage. A branched system of petroleum and gas pipelines is in operation for the transport of hydrocarbon raw material to the central regions of the USSR, but fuel is conveyed here with major stoppages along the railroad.

To establish a basis for obtaining motor fuels based on the Uren gas condensate deposit—this was the task set for the scientific and production organizations of the USSR Ministry of the Gas Industry, Ministry of Construction of Petroleum and Gas Industry Enterprises, and the Ministry of Chemical and Petroleum Machine Building.

Pilot plant exploitation of the gas condensate strata of the very large Uren deposit began four years ago. The first output—an excellent raw material for the production of motor fuels—was obtained half a year later at the Surgut condensate stabilization plant.

The basic kinds of industrial equipment were developed at the level of inventions. Their engineering corresponds to, and in some cases exceeds, modern world achievements in this field.

The maximal concentration of projects in industrial areas was achieved by the construction of a complex. A

single system of main-line transport of unstable condensate from Uren to Surgut over a distance of 700 km was used for the first time. In all, 850 million rubles of capital outlays were saved because of the use of modern industrial processes and project solutions.

This work, which has no analogues in world practice, in our opinion, deserves to be awarded the USSR State Prize.

12410

**Features of Structure, Crystallinity and Gas-Permeability of Hollow Fibers Made from Poly-4-methylpentene-1**  
*18410298a Moscow VYSOKOMOLEKULARNYYE SOYEDINENIYA in Russian Vol 30, No 2, Feb 88 (manuscript received 15 Aug 86) pp 334-341*

[Article by A.Sh. Goykhman, V.I. Kirichenko, G.A. Budnitskiy, A.Z. Sheyman, V.M. Irkley and Yu.A. Kostrov, Kiev Branch of All-Union Scientific Research and Design Institute of Artificial Fibers]

[Abstract] Poly-4-methylpentene-1 [PMP] is now considered to be one of the most promising polymers for use in creating hollow fiber gas-separating membranes. This polymer is used because of its good diffusion characteristics and because it is possible to produce hollow semi-permeable fibers without significantly changing the formation technology used for traditional fiber-forming polymers. This article described and discussed a reliable method of assessing the degree of crystallinity of PMP and presented reliable quantitative correlations between the degree of crystallinity and the coefficients of permeability of different gases. Parameters of a unit cell of PMP were presented, and an X-ray diffraction method of determining the degree of crystallinity of this polymer by using a standard curve of scattering with amorphous PMP was developed. An algorithm for approximating the standard curve of scattering with amorphous polymer to the experimental curve of scattering was developed and discussed. The degree of crystallinity of PMP hollow fibers was calculated. Quantitative correlations between the degree of crystallinity and coefficients of permeability of nitrogen and helium for hollow PMP fibers were produced. Figures 5; references 19: 7 Russian; 12 Western.

02791

**Electron Microscopy Study of Ultrathin Synthetic Fibers**  
*18410298b Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian (manuscript received 19 Aug 86) Vol 30, No 2, Feb 88 pp 353-358*

[Article by M.V. Tsebrenko, Kiev Engineering Institute of Light Industry]

[Abstract] Electron microscopy studies showed that ultrathin fibers produced by free flow of the melt, without further longitudinal deformation, are oriented with coarser fibers, having a clearly pronounced spherulitic structure. They have a heterogenous cross-section along the fiber length due to uncompleted decay following the wave mechanism. Development of highly-elastic deformations and normal stresses caused decay of the microfibers following the wave mechanism in both incompatible polymers and in mixtures of compatible polymers and prevented production of fibers with super-small thickness. Figures 3; references 10: 7 Russian; 3 Western.

02791

**Nonstationary Processes in Thin Films Formed by Laser Spraying of Polymers in Vacuum**  
*18410298c Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian (manuscript received 15 Sep 86) Vol 30, No 2, Feb 88 pp 448-452*

[Article by A.M. Krasovskiy, Ye.M. Tolstopiatov, and P.N. Grakovitch, Institute of Mechanics of Metallo-polymer Systems, BSSR Academy of Sciences]

[Abstract] A study of nonstationary processes proceeding in thin films formed by laser spraying of polar polymers in a vacuum and the effect of these processes on properties of thin film systems used polychlorotrifluoroethylene, polycarbonate, and polysulphone as starting materials. Films were formed on backings made from aluminum, copper, and polytrifluoroethylene and on backings with thin-film coatings made from chromium, copper, and aluminum. The basic nonstationary chemical processes occurring in the films were postpolymerization of molecular fragments and molecular regrouping. The relationship between them was determined by the regimes of forming and subsequent processing of the films. Figures 4; references 14: 8 Russian; 6 Western.

02791

**Oxidative Polymerization of Vinylacetate, Stimulated by Laser Radiation**  
*18410299a Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B, GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOG'CHESKIYE NAUKI in Russian (manuscript received 29 Jun 87) No 2, Feb 88 pp 56-59*

[Article by K.A. Nersesyan, R.O. Chaltykyan, and I.M. Beyleryan, Yerevan State University]

[Abstract] An explanation of the true causes of vinylacetate polymerization, induced by laser radiation in the region of wavelengths of  $\lambda$  is greater than 300 nm was presented, and the real mechanism of the polymerization process was established. Data concerning the dual role of amines and aminoalcohols in the process of non-initiator photopolymerization of vinylacetate in the 303-313 nm region confirmed the assumption that the mechanism of photostimulated vinylacetate polymerization should be described by the classical scheme of polymerization in the presence of substantial initiators. The accelerating effect of amines during vinylacetate polymerization accelerated decomposition of oligoperoxides of oxidized vinylacetate. A study of the molecular characteristics of polyvinylacetate formation while varying the average power of incident laser radiation showed that by varying the power of incident laser radiation, one can regulate the molecular mass and Shultz parameter of polyvinylacetate during polymerization of oxidized vinylacetate. Figures 3; references 15: 13 Russian; 2 Western.

02791

**Modernized Type MChT Worm Machines for Processing Rubber Mixtures**  
*18410294c Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 2, Feb 88 pp 16-17*

[Article by engineers I.P. Ponomarev, A.G. Govsh, A.I. Gusarenko, and A.S. Levina]

**[Abstract]** Type MChT single-screw worm machines with 63.9 and 125 mm diameter worm drives for processing hot rubber mixtures with Mooney viscosity up to 90 at temperatures of 50 to 80°C at the loading funnel have been modernized. The machine is delivered with a direct flow universal head and automated electric drive system allowing smooth regulation of the worm speed between 0 and the rated speed by changing the motor armature voltage and from rated to maximal speed by changing the exciter current. The new machines have successfully passed industrial testing and are recommended for series production.

6508

### **Shortages of Chemical Fibers for Clothing Industry**

*18410305a Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Apr 88 p 2*

[Article by A. Yevgenyev and I. Zhagel, Moscow, under the title: "Departments in the Trenches;" first two paragraphs, introduction under the subheading: "Consumer goods: Request and Proposal"]

[Text] "So you are now becoming a chemist?"

"There's no alternative. We have already understood that you can do nothing with the Ministry of the Chemical Industry. Just discussions. And we must get things done." In order to "get it done" V. Semenov, general director of the Mogilev Silk Fabrics Association, decided to provide for his own chemical production, purchasing it from abroad. However strange it may seem, the USSR Ministry of Light Industry supported the proposal.

When wishing for something it is possible to speak ironically to one's heart's content about the situation. And really, what of it? Today the textile workers are installing a line for the production of polyester fibers, taking away a part of the chemist's job. Tomorrow they themselves will begin to produce polymer, and who knows when they will go in for oil production? Get the idea? The hand itself reaches for the "stop" button.

Wait a minute, do not hurry. Do we not every day tell these same textile workers not to expect manna from heaven, but to exhibit enterprise and initiative? And they have finally displayed it. And what's so strange and can they be blamed?

"Recently we have not received a single fundamentally new fiber from chemists. Not one," states director Semenov. "What shall we use in producing new fabrics? We have fairly good textile equipment, but we cannot give the client up-to-date material, for blouses, for example. And it's not just us..."

Alas, not just in the factory. Go through the salesrooms of department stores, talk with the salespeople and customers, and you understand: the clothing produced by light industry from chemical raw material is characterized by one factor in common: all of that material came to us from abroad. And on top of that, with an enormous delay.

"But what do you want? The monopoly of enterprises of the Ministry of the Chemical Industry in the internal market for all these years has been unlimited," remarks G. Kuznetsov, chief chemist of the All-Union Scientific Research Institute for the Processing of Chemical Fibers of the USSR Ministry of Light Industry. "They pushed for production and they did not concern themselves with the variety. We usually do not receive new types of fibers and threads until a new enterprise is put into operation."

True, no money was spared on new construction. But even the import purchases failed to pay off. For example, a year ago a line of Japanese equipment was put into operation for production of fur fiber, but the major consumer, the combine at Zhlobin, raised its hackles: we have no need for this product. And why not? It appears that while construction was in progress and the equipment was being installed the wily Japanese somehow learned to produce a more valuable product, a shaped fiber. And they began to supply it to this very same Zhlobin plant.

Pretty sad, isn't it? Evidently, neither effective licenses nor costly "know-how" ensure us any irrevocable acceleration if our own scientific and technical thought is asleep, if we are not seriously concerned with promising development work. And what treasury can withstand the concept: new production—new factory.

The cooperating enterprises finally decided that it was impossible to go on in this way. And the two deputy ministers of the collaborating branches, A. Pushkin and V. Smirnov, signed an unprecedented document: a plan for the mastery of chemical fibers and threads for an entire 5-year period. And what happened?

"Over a period of 2 years 71 orders were placed for new materials called for by the plan," they reported to us at the Ministry of Light Industry. "Seven orders were filled." Chemists are seeking any excuse for nonperformance.

"We cannot accept such orders; they are not sound enough," the chemists insist.

It is all clear: there is typical trench warfare between the two departments. To be more precise, the bureaucrats of these departments who are responsible for technical progress. And who punctually receive a salary for this responsibility to perform, but there is no progress. Remember the words of the satirist: Why is stagnation possible? Because there are people who can calmly stand in place and curse stagnation.

But for what reason do the enterprises stand still? Particularly now, with self-financing? Is it possible that they are just sitting around?

"Well, you know, it is actually simpler to make agreements directly with enterprises," they agreed with us at the Ministry of Light Industry. "For example, look at how work developed at Mogilev."

In Mogilev in reality it seemed to us that we had landed on another planet. Quiet and peaceful, without any fanfare, two local production associations—for silk fabrics and chemical fibers—decided the following: during a 5-year period they would master 12 new types of production. A work program was drawn up that was approved "at the top."

V. Semenov, the director of the silk plant and a man who is active and assertive by nature, told how they sought an approach to such collaboration: "We indeed knew. We appeared there with empty hands and it rained excuses: that is not here, the second, the fifth. Therefore we immediately strove to find a way out. We invited a foreign firm for consultation on dyes. They would suggest something, teach something, and possibly sell something."

We also looked to the chemists for experience. And they subtly let us understand that to be sure they would not refuse the assistance of foreign specialists, but they dragged their feet, so to speak. They even calculated that about 200 persons could work on the development of a new variety. Among them, seven candidates of sciences.

And then, fortunately, we thought a little—here it is, a model of interbranch relationships. Rather than chase orders through the upper levels of the administration, why not help the enterprises establish direct relationships and arrange cooperation with foreign partners... And collaborating associations always find a common ground under such conditions.

How good it is to believe in what you desperately want to believe. You involuntarily begin to simplify and set things straight. In short, we prepared an article for the newspaper. It told of the advantages of direct relationships and about the departmental power to slow things down. Everything that was said was true. But, as we now understand, not everything was said. It was not the editor, as is customary in newspaper practice, but V. Semenov, the main hero of the future publication, who

subjected it to the most rigid scrutiny. Arriving in Moscow, he reported that the association is purchasing an import line for the production of polyester fibers.

Really now! And what about the joint program for work with our own chemists?

"Yes, they do something, but slowly. When they give us these fibers there will no longer be any special need for them. The chemists are not interested, you understand?"

Really? But now the legislation for state enterprises has gone into effect. And now it will possibly be easier to stimulate collaboration.

"You have contractual prices in mind?" Then you go to director Yefanov of the Mogilev "Khimvolokno" and you learn the extent to which he has personally gained from these prices.

Now we know. Judging from the past year—not a kopeck. Is it possible that the stimulus is not a stimulus at all? Why? The fact is that the director and other enterprise managers receive bonuses under a special regulation. It also provides for approval for new technology. But in practice the maximum bonus, limited by a ceiling, is usually taken away by scrap metal, consumer's goods, and other items.

"It makes no sense at all to me," says Semenov, "why the order of approval of the director and other main specialists should be prescribed from above, point-by-point. All the achievements and failures of the enterprise in the long run are reflected in the profits. So would it not be more correct to set the earnings of managers in direct dependence on this profit? Without any reservations and conditions? Let the base salary of the director be low, say a hundred rubles, but the rest be proportional to the increase in accumulations. Then he himself and his closest comrades will not be content with a low salary and will constantly strive to increase profits."

We will be realists: the optimal economic mechanism is only being formed. It is still necessary to switch industry to wholesale trade of the means of production and restructure pricing. In other words, it is necessary to organize an integrated economic system designed for autonomous accelerated movement. But one thing is quite evident: any logically reproachless system will usually remain a speculative structure if it is not based on the personal material interest of every person involved... And all the more for those who are in control of an administration.

UDC 677.022.782

**Effect of Preliminary Heat Treatment on Properties of Textured Carbimide Fibers**  
*18410313a Moscow KHIMICHESKIYE VOLOKNA in Russian No 1, Jan-Feb 88 (manuscript received 28 Jan 87) pp 33-35*

[Abstract by V.A. Ivanoshova, V.A. Usenko, L.A. Martynova, Z.S. Bunareva, E.A. Rassolova, and M.A. Zharkova]

[Abstract] The effect of heating prior to the texturing of carbimide fibers (consisting of 80 elementary fibers and having a linear density of 29.4 threads) on their stretching properties and crimp stability was studied at 110, 120, 130, 140, and 160 degrees C. A specimen that was not subjected to preliminary heat treating served as a control. A heat treatment temperature of 140 degrees C was found to be necessary to produce high specific fiber properties and satisfactory physicomechanical properties. It is necessary to texture the fibers at a temperature 50 degrees C above the heat treatment temperature in order to obtain a crimp stability higher than 60%. References: 4 Russian.

12973

UDC 677.494.723.21:547.321

**The Effect of Radiation-Induced Crosslinking on the Thermomechanical Properties of Tetrafluoroethylene-Ethylene Copolymer Fibers**  
*18410313b Moscow KHIMICHESKIYE VOLOKNA in Russian No 1, Jan-Feb 88 (manuscript received 22 Jul 87) pp 37-38*

[Article by A.V. Berzrozhvannykh, A.M. Kronfeld, N.K. Podlesetskaya, and V.I. Poddubnyay]

[Abstract] The properties of fluorine copolymers have aroused interest because they are more convenient to process than are homopolymers. Tetrafluoroethylene-ethylene copolymers have a greater radiation stability than does polytetrafluoroethylene, and when subjected to irradiation, it tends to form crosslinks rather than succumb to processes of radiation breakdown. For this reason, a study examined the effect of irradiation on oriented fibers of this copolymer. Radiation crosslinking was implemented with a C-60 source (radiation dose, 275 rad/s). The extrusion obtained from the fiber melt was subjected to heat stretching. The thermomechanical properties of the fibers irradiated before and after extrusion were then studied. It was discovered that the physical and mechanical properties of crosslinked fibers can be regulated by altering irradiating conditions, with oriented fibers being more sensitive to the disorientation effect that occurs during crosslink formation. Intermolecular hydrogen bonds are therefore more likely to break

in anisotropic fibers than in isotropic fibers because anisotropic fibers are more prone to become directionally disoriented as a result of crosslinking. The study showed that, as a result of the irradiation, the fibers' operating temperature could be increased by 80 degrees C. References: 2 Russian.

12973

**Composite Fiber Kompalen-D**  
*18410313c Moscow KHIMICHESKIYE VOLOKNA in Russian No 1, Jan-Feb 88 (manuscript received 8 Jul 87) pp 37-38*

[Article by M.T. Primkulov, T. Gulyamov, L.A. Khayrullina, A.S. Sadikov, and A.V. Belyy]

[Abstract] A composite acetate-polyamide fiber, Kompalen-D, was produced at the Fergana Chemical-Fiber Plant by joining a polyamide fiber to an acetate fiber as the acetate fiber was being formed, mixing the fibers in a pneumatic mixing attachment to a spinning frame, and spinning the composite fiber. Fibers with a linear density of 10, 11.7, 14.3, and 16 threads and 136 and 200 twists per meter were produced. With silk, Kompalen-D yields fabrics that have improved physical and mechanical properties, good drapability, and a soft feel. With cotton, it yields fabrics whose structure and properties are improved. It is recommended that a 50:50 blend of Kompalen-D and cotton be tested under industrial conditions. For use as warp, it would have to be twisted to 300 twists per meter. The Kompalen-D thread with 136 twists per meter that is being processed in the sector is recommended for series production. References: 3 Russian.

12973

**Study of Sulfur-Vulcanization of Diene Rubbers and Structure and Properties of Rubbers Containing Bis-(tetraethyl diamidophosphoryl)disulfide, Secondary Accelerators, and Metal Oxides**  
*18410313d Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 30, No 3, Mar 88 (manuscript received 29 Nov 86) pp 591-597*

[Article by T.V. Ratnikova, Ye.A. Zvonkov, G.M. Sheshina, N.Ya. Gracheva, and A.I. Ginak, Leningrad Engineering Institute imeni Lensovet]

[Abstract] This article reports a study of the sulfur-vulcanization of several diene rubbers, using bis-(tetraethyl diamidophosphoryl)disulfide and tetraethyl thiuramdisulfide (Thiuram E) as accelerators in combination with various secondary accelerators and CaO, CdO, MgO, and ZnO as activators. Rubbers vulcanized with bis-(tetraethyl diamidophosphoryl)disulfide show preferential crosslinking of the high-molecular weight fraction of the polymer, less degradation of molecular chains, higher concentration of active network chains,

higher strength, and longer fatigue life than those vulcanized with Thiuram E. Altax and triazine disulfide were found to be efficient secondary accelerators and CaO and MgO efficient activators for use with bis-(tetraethyl diamidophosphoryl)disulfide. A uniform vulcanization rate, narrow range of failure stresses, long fatigue life, and resistance to the development of compression sets characterize the rubbers with bis-(tetraethyl diamidophosphoryl)disulfide. References 28: 19 Russian, 9 Western.

12973

**Synthesis and Investigation of Water-Soluble Polymers Based on Methacrylic Ester of 1,2,5-Trimethyl-4-phenyl-4-oxypiperidine gamma-Isomer**

18410314d Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA KHIMICHESKAYA in Russian No 2, Mar-Apr 88 (manuscript received 27 Oct 87) pp 50-53

[Article by B.A. Zhubanov, S.A. Mochkevich, E.I. Kom-bikova, K.D. Praliyev, and Zh.I. Isin, Chemical Sciences Institute, Kazakh Academy of Sciences, Alma-Ata]

[Abstract] Compounds of the piperidine series manifest various kinds of physiological activity (psychotropic, analgesic, anesthetizing). In order to shed additional light on the characteristics of this series, a study was made of the synthesis of water-soluble polymers based on the methacrylic ester of the 1,2,5-trimethyl-4-phenyl-4-oxypiperidine  $\gamma$  isomer. Polymerization was carried out in aqueous or water-alcohol solutions in the presence of several chemical initiators in a flow of inert gas at 60-75°. Radiative polymerization of some aqueous solutions was carried out in evacuated glass ampules with  $\gamma$ -irradiation, after which the polymer was precipitated in acetone, filtered, washed with acetone, and dried. Radiative polymerization was carried out in an aqueous solution by changing the concentration of monomer and time in the reactor (change in irradiation dose). Formation of the polymer is confirmed by IR-spectroscopy data. The variation of radiative polymerization conditions makes it possible to obtain polymers with stipulated properties (with respect to molecular mass, solubility, etc.). The characteristic viscosity of the polymer increases with an increase in the concentration of the polymer in the solution. With an increase in the irradiation dose to 0.3 Mrad, there is a marked increase in characteristic viscosity. A further increase in the irradiation dose reduces viscosity, evidently due to destruction of the forming polymer. With an increase in the irradiation dose in the initial period, polymerization occurs at a high rate, and the yield of polymer attains 80% per hour, after which it remains almost constant. Figures 5; references: 8 Russian.

5303

**Abrasion-Resistant Composite Coating for Rubber Parts of Friction Joints**

18410315b Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHIMICHESKAYA TEKHNOLOGIYA in Russian Vol 31, No 2, Feb 88 (manuscript received 4 Aug 86) pp 97-100

[Article by V.F. Kablov, A.M. Khaymovich, and A.M. Ogrel, Volgograd Polytechnic Institute]

[Abstract] The authors describe several methods that have been used to improve the antifriction properties and durability of rubber parts by packing the rubber with various fillers, particularly polytetrafluoro ethylene, which is applied as a dispersion to the rubber surface and followed by thermal shock. The treatment was found to lower the coating's friction coefficient and make it more durable without changing the properties of the rubber itself. Durability was also increased by the addition of low-molecular weight additives and the use of a cross-linking group as the polymer binder. By applying regression analysis, the authors established the relationship between a fluoroplastic elastomer coat's physicomechanical properties and its wear rate. An electron microscopic examination of such coats showed that the coat's upper fluoroplastic layer improved its antifriction properties, whereas the bottom elastomer layer improved its adhesion to rubber. Figures 1; tables 2; references: 12 Russian.

6289

**Ways To Increase Quality of Polymer Goods for Popular Consumption**

18410317a Moscow KAUCHUK I REZINA in Russian No 2, Feb 88 pp 2-4

[Article by V.I. Treshchalov]

[Abstract] By the year 1990, the volume of production of polymer footwear should increase by a factor of 1.32, but serious problems arise in ensuring its quality and variety (similar problems arise with respect to other articles such as toys, beach balls, and sports items). It is essential to reduce the input of manual labor by introducing such processes as molding products from thermoplastics and rubbers under pressure. By 1990, the amount of footwear produced by pressure molding will increase up to 50%. The introduction of this process will not only reduce the work input by a factor of 4 to 5, but it will also reduce the expenditure of polymers and power (although this reduction will be offset in part by equipment costs). None of this can be accomplished without using greatly increased automation at all levels of planning and production. In addition to the problem of greatly lengthening the lifetime of footwear, the designs call for footwear that in many cases incorporates two or three necessary properties. This entails ensuring quality adhesion of these components. Since quality is highly dependent on the materials used, many proposals to upgrade the material

are in doubt due to the high costs. From 1988-1989, plans call for the industrial introduction of new technology for producing artificial suedes and leathers by aerosol spraying on a textile backing of polymer material without using solvents. A flexible automated system is to be developed for the production of footwear. A program has been drawn up for new and modernized technological processes to be introduced during the 12th Five-Year Plan. However, without the development and production of new equipment in the USSR, it will be impossible to reoutfit enterprises and increase quality.

5303

### Accumulation of Metals in Rubber Films Which Are Oxidizable on Brass

18410317b Moscow KAUCHUK I REZINA in Russian No 2, Feb 88 pp 7-9

[Article by I.M. Yeliseyeva, V.G. Sviridenko, and D.G. Lin]

[Abstract] The brass plating of the surface of steel and other metals is a widely used method for increasing the adhesiveness of a rubber-metal system. However, no study has been made of the dissolution of the components of brass in rubbers during contact oxidation, although this is of great importance in the technology for producing various adhesive compounds based on elastomers. Accordingly, a study was made of the kinetics of the accumulation of metals in films of some rubbers that are oxidizable on brass. The experiments were made by using unstabilized rubbers: natural butadiene (SKD), butadiene-nitrile (SKN-40), and butadiene-styrene (SKS-30ARK-PN). After preliminary plastification, the natural rubbers were dissolved in benzene, SKN-40 in acetone, and SKD and SKS-30ARK-PN in benzene. By means of eliminating the solvent from the rubber solutions, films were obtained that were then oxidized in air in heat chambers. The backing used was brass and its components (copper and zinc). The experiment revealed that an increase in test temperatures simultaneously results in an increase not only in rate of oxidation and cross-linking but also the rate of transfer of brass components into the rubber. Regardless of the oxidation temperature, under the selected experimental conditions (thickness of rubber film, oxygen content in air, range of test temperatures, materials used, and the presence of pollutants), the metal concentration in the film corresponds to the degree of its oxidation. In contact oxidation of rubber, the kinetics of the accumulation of metals in it, the components of brass, is dependent on the nature of the polymer. Figures 4; references: 12 Russian.

5303

### Gas Permeability of Some Rubbers

18410317c Moscow KAUCHUK I REZINA in Russian No 2, Feb 88 pp 17-18

[Article by A.N. Vaulin, V.P. Kovtun, L.M. Naberukhin, and A.V. Shulakov]

[Abstract] Elastomers can be used in gaskets for detachable connections in the design of transport containers for

moving depleted nuclear fuel from nuclear power stations. Such containers must have adequate resistance to radiation, durability in working media at specified temperatures, and low gas permeability. A study was made of the helium gas permeability of rubber mixtures and rubbers based on SKF-26, SKTV, and SKEP-PP in a temperature range corresponding to the use of transport container gaskets (the literature gives data only for the narrow range between 293 and 393 K). The tests were made by using a laboratory apparatus (described and illustrated in the text, with its 16 components identified) at 293 to 573 K by the vacuum chamber method using a helium leak detector. A table gives the values of the permeability, diffusion, and solubility coefficients for the three types of rubbers and the energy characteristics of the process of diffusional gas mass transfer. The research results are of practical value for the developers of containers for the transport of depleted nuclear fuel since they make it possible to evaluate the effectiveness of sealing of such containers with rubber gaskets as early as in the planning stage, although data on the gas permeability of rubbers must be examined together with their other characteristics. Figures 2; references: 6 Russian.

5303

### Synthesis and Properties of Schiff Polybases

18410317e Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: SERIYA 4. FIZIKA. KHIMIYA in Russian No 1, Feb 88 pp 60-63

[Article by A.F. Shelikh, Ye.T. Pankratova, and B.I. Tikhomirov (deceased)]

[Abstract] Schiff polybases have many interesting and important properties such as heat resistance and photo- and thermochromism, and they are used as high-temperature dielectrics and antioxidants. However, most of these polymers are infusible and poorly soluble, making their use in polymer materials and articles difficult. This article gives the results of research on condensation polymerization, structure, and properties of the products of interaction of terephthalic aldehyde and the homologous ring of aliphatic diamines with the general formula  $H_2N-(CH_2)_x-NH_2$ , where  $x = 2$  to 6. A table gives the characteristics of products of the condensation polymerization of equimolar quantities of terephthalic aldehyde and aliphatic diamines (chloroform solvent; reaction time, 3 hours). IR spectra of a series of Schiff polybases were obtained. The physicomechanical properties of prepared films were studied. Films from the Schiff solution 6-T-1, for example, have a tensile strength of 120 kg/cm<sup>2</sup>, relative expansion of 10 percent, and permanent expansion of 0 percent. The thermal stability of the films was evaluated by thermogravimetric analysis. The samples were stable up to 483 K, and the mass losses at 523 K were about 3 percent. The data show that the condensation polymerization of terephthalic aldehyde with aliphatic diamines having different numbers of

methylene groups transpires rather specifically. The formation of linear chains with 1,3-diaminopropane is evidently attributable to their adequate rigidity, and a limitation of chain growth in this case sets in due to the kinetic deactivation of the reaction center. During condensation polymerization of terephthalic aldehyde with 1,6-diaminohexane, chain growth ceases due to the appearance of macrocycles, which tend toward the formation of stable associates in chloroform. Figures 4; references 14: 10 Russian, 4 Western.

5303

### Thermophysical Study of Carbon Fiber Materials and Carbon-Carbon Type Composites

18410186b Leningrad ZHURNAL PRIKLADNOY KHMII in Russian Vol 60, No 11, Nov 87 (manuscript received 31 Mar 86) pp 2497-2503

[Article by G.I. Kurnevich, A.S. Skoropanov, N.P. Radimov, and Yu.F. Gridina, Belorussian State University imeni V.I. Lenin]

[Abstract] Present-day materials technology is proposing ever-widening practical applications of graphite and graphitized substances for service under severe conditions. Optimal selection of carbon fiber (UVM) and composite (KM) materials based thereon for service at high temperatures requires a knowledge of their thermophysical characteristics, which are patently lacking in the literature. Also, such information would help solve problems in preparing UVM and KM having the required aggregate of heat resistant characteristics. The purpose of the present work was to study the thermophysical properties of several carbon fiber materials based on cellulose hydrate (GTs) and polyacrylonitrile (PAN), as well as some carbon-carbon type composites based on them. The GTs-based UVM samples were prepared by maintaining the GTs under tension at temperatures to 600 K, after first saturating them with 20 to 25 percent ammonium chloride solution, followed by further heat treatment at 800 to 2,700 K. The UVM-PAN samples were prepared under the same temperature conditions. All KM samples passed through a graphitization stage. The heat capacities and coefficients of heat conductivity and thermal expansion were determined. The results indicate that these properties vary with the shaping features of the composite materials; the heat capacities of carbon-carbon type UVM and KM are close to that of natural graphite. The experimental data were processed on a "Minsk-32" computer. Figures 3; references 5: 4 Russian, 1 Western.

12765

### Surface Tension of Heparin-Containing Polyurethanes

18410188a Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR: SERIYA B, GEOLOGICHESKIYE, KHMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 87 (manuscript received 9 Jun 87) pp 38-41

[Article by I.L. Karpova, D.V. Vasilchenko, A.Ye. Faynerman, and T.E. Lipatova, presented by Academician, UkrSSR Academy of Sciences, Yu.S. Lipatova, Institute of the Chemistry of High Molecular Weight Compounds, UkrSSR Academy of Sciences, Kiev]

[Abstract] In recent years, a new trend has been rapidly developing in the development of hemocompatible polymers, namely, the preparation of polymeric materials (mostly segmented polyurethanes) having a high degree of microphase separation. Earlier work along this line indicated an improvement in the hemocompatibility of polymers when microphase separation is present. It should be noted that in the majority of cases hemocompatibility was judged by the adhesion of thrombocytes to the surfaces in contact with blood. In the present authors' opinion, the polymer surface subject to microphase separation has a mosaic-like structure (the micro-components having both hydrophilic and hydrophobic properties), making it similar to that of living tissue. An evaluation was made of the relationship between the flexible and rigid blocks found on the surfaces of segmented polyurethanes based on 4,4'-diphenylmethane diisocyanate, ethylene diamine, and polyethers having various free surface energies and molecular weights. The authors of this work hypothesized that the interfacial free energy at the air interface becomes minimized due to the increase in concentration of a component having a lower surface energy at the interface. It is the present authors' view that this serves to confirm the role of the mosaic structure. On the basis of surface characteristics, it was concluded that hemocompatibility is determined by the degree of microphase separation and the surface status. The latter two are determined by the surface energies of the components. It was previously demonstrated that the surfaces of segmented polyurethane films of the same chemical nature but shaped at different interfaces (air, Teflon) have different hemocompatibilities in thrombocyte adhesion. The purpose of the present work was to prepare polyurethane semicarbazide polymers (PUS) modified with heparin throughout the entire bulk. The quantity of heparin must be low enough not to greatly disrupt the microphase separation of the polymer, yet high enough to have an effect on the surface properties of the PUS. Hemocompatibility reportedly facilitates the grafting of biologically active compounds such as heparin to the polymer surface. The surface tension and other properties of eight polymers are presented. The data indicate that small quantities of heparin decrease the surface tension of the samples and have little effect on other properties such as modulus of elasticity, intrinsic viscosity, and elongation to rupture.

**Modification of the surface properties of heparin-containing polyurethanes in conjunction with their microphase separation thus suggests that they may be utilized as materials for fabricating cardio-vascular prostheses since introduction of a natural surface-active blood anticoagulant into the composition of the polymer material should increase its hemocompatibility and thrombo-resistance.** Figure 1; references 11: 5 Russian, 6 Western.

12765

**Ways and Prospects of Improving Rubber as Construction Material for Modern Technology**  
*18410240c Moscow KAUCHUK I REZINA in Russian No 12, Dec 87 pp 13-18*

[Article by D.L. Fedyukin, Director NIIRP (Scientific Research Institute of the Rubber Industry)]

[Abstract] In pre-revolutionary Russia, all rubber production was handled by only four enterprises, using imported natural rubber. Today, over 100,000 different rubber items are being produced in quantities ranging from a few tenths of a gram to several tons. Although the structure of production of industrial rubber goods in the USSR differs somewhat from that of the developed capitalist nations, the basic types are still mainly cast and injection moldings, conveyor and drive belts, and sleeves. Eighteen types (about 150 grades) of rubber are used today in domestic rubber production to meet today's extremely diverse needs. Although the general demand for special purpose rubbers having high degrees of heat, frost, and corrosion resistance is not great at the present time, it will continue to grow with time. In recent years, the appearance of rubbers based on new monomers has ceased, and this tendency will apparently continue to the year 2000. More realistic ways of improving the quality of rubbers having new properties will be by improving and broadening new synthesis methods, such as anionic polymerization, the use of new rubber variants synthesized from known monomers, chemical modification of rubbers (modification of the hydrocarbon chains of SKI-3 with p-nitrosoamine groups to increase cohesion), combining various elastomers to increase ozone resistance, and combining rubbers with plastics such as PVC, polypropylene, polyacrylonitrile, styrene, and fluoroplastics to increase ozone resistance and decrease costs. Some rather new and very promising materials are thermoelastoplastic (TEP) and liquid rubber, which need no vulcanizer and have a simple recipe, paving the way to waste-free technology. Other areas of improvement include the use of organic peroxides as accelerators, modified fillers, and filler combinations. Despite its unique properties, rubber can never compete with metals and chemical fibers in regard to strength and heat resistance so that conveyor and drive belts are still reinforced with textiles and metals. Here, the use of chemical fibers instead of cotton or paper increases the service life of fan belts on automobiles.

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**Thermostable Elastomers Reinforced with Kevlar**  
*18410240d Moscow KAUCHUK I REZINA in Russian No 12, Dec 87 pp 21-23*

[Article by S.V. Sokolov, Deputy Director VNIISK (All-Union Scientific Research Institute of Synthetic Rubber imeni S.V. Lebedev)]

[Abstract] One of the most significant achievements in the chemistry of silicon and fluoroorganic compounds was the development of thermostable elastomers that also have high resistance to gasoline, oil, and chemicals. The use of components made of thermostable rubber to a large extent determines technological progress in the aerospace, radio electronics, machine building, and medical industries. Reductions in weight and fuel consumption and higher reliability in the latest models of automobiles has led to higher temperatures under the hood and in the transmission, which almost completely excludes the use of conventional organic rubber as gasket material. Deep oil drilling and production of sulfur-rich crudes require rubbers that are resistant to oil, high temperatures, caustic drilling muds, and sulfur. Under these conditions, gaskets made of the perfluorinated elastomer Kalrez, reinforced with Kevlar fiber, maintain their properties at 210° C and pressures to 105 MPa. Great savings are made in machine building applications by employing liquid gaskets that are shaped by cold hardening of a liquid siloxane rubber in situ, thereby resulting in airtight seals of machine components that would otherwise require extensive machining. Other areas of application are glass fiber optics, medical prostheses, and organ replacement. A major shortcoming of silicon and fluorine elastomers lies in the difficulties in obtaining the initial monomers, resulting in their high cost. In 1979, 40,300 tons of siloxane rubber were produced in the United States and 30,000 tons in Japan and Western Europe. The more costly fluorinated rubber is produced in even less quantity. While the polysiloxanes are today considered costly special purpose rubbers, it must never be forgotten that they are made of the most widely available elements, namely, oxygen and silicon, which are virtually in inexhaustible supply. References 2 (Russian).

12765

**Effect of Total Exposure to Outer Space on Certain Physical Properties of Organic Glass**  
*18410240e Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 29, No 12, Dec 87 (manuscript received 23 Jun 86) pp 2577-2584*

[Article by O.V. Startsev, V.P. Rudnev, Yu.N. Ivonin, Ye.F. Nikishin, Ye.A. Barbashev, V.A. Bogatov, and B.V. Perov]

[Abstract] A study examined the effects of long-term exposure to outer space conditions on organic glass SO-120 (polymethylmethacrylate containing phenyl

salicylate) to determine the possibilities of using this material in space technology and to study the mechanism of the physicochemical processes that take place under these conditions. Rectangular samples measuring 65 mm by 5 mm by 2.5 mm were placed in a metal cassette-frame and exposed for 102 and 456 days to outer space conditions. Some of the samples were screened with PTFE [polytetrafluoroethylene] film to determine the effects of individual factors. Specifically, change in weight, linear dimensions, density, light transmission, shock resistance, dynamic mechanical properties, temperature conversions, and coefficients of linear thermal expansion were determined, and the mechanism of the processes culminating in rupture of the carbon-carbon bond, photolysis of side ester groups, and deterioration of intercluster regions of the polymer in the 110  $\mu\text{m}$  surface layer were determined. The screened samples did not suffer surface deterioration. The results obtained may be used as bench marks to correct ground-level laboratory tests. Figures 6; references 10: 8 Russian, 2 Western.

12765

UDC 678.5.046.01

#### Viscoelastic Properties of Organic Plastics Having Surface-Modified Reinforcing Fillers

18410250b Moscow PLASTICHESKIYE MASSY in Russian No 1, Jan 88 pp 24-25

[Article by S.N. Ulyanenko, G.M. Magomedov, G.P. Mashinskaya, and Yu.V. Zelenev]

**[Abstract]** Polymeric composite materials containing reinforcement fillers based on aromatic amide fibers are very strong and are highly resistant to heat and chemicals. These properties stem from the relaxation processes that take place with heating at various temperature-time intervals wherein molecular mobility in the system becomes a function of the chemical nature of the components and the intensity of their interactions. Various modification methods are used to control the structure and properties of the plastics, the most effective being modification of the reinforcement filler (which allows a significant change in the intensity of component interaction). The problem of lowering the acidity of aromatic amide fiber organic plastics is extremely important because their high acidity makes them highly corrosive when in contact with metals. This can be done by using a diffusion-chemical method to modify the surface of the reinforcement filler in the organoplastic. The present work examines the effects of such modification on the molecular structure of organic plastics. Molecular mobility in thermoreactive organic plastics having both unmodified and neutralized reinforcing fillers was studied by using methods of induced ductile and shear stresses and thermoelectret analysis. Young's modulus, the shear modulus, and molecular mobility were determined for organic plastics based on epoxy phenolic, epoxy dian, and epoxy novolac resins at temperatures ranging from

393 to 573 K. The formation of a chemical bond between the matrix and the reinforcement fiber and the diffusion of binder components into the bulk of the organic fiber play a significant role in the formation of a molecular structure. Component reaction features are determined by the structure of the interface transition layer. A developed transition layer becomes a trap for electrons injected during preparation of electret material or charge carriers. Release of electrons from these traps during depolarization causes the appearance of an inverse maximum on the thermodepolarization current thermogram. Diffusion-chemical surface modification of the reinforcement filler in an organic plastic results in the formation of a more uniform transition layer, within which molecular mobility is manifested in an alpha-prime relaxation process. In this case, there is no inverse maximum on the thermogram. Thus surface modification of the reinforcement filler by diffusion-chemical means has a significant effect on the molecular structure of organic plastic. Figures 4; references 8: 7 Russian, 1 Western.

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UDC 678.686:678.766:536.495

#### Heat Resistance of Epoxy Molding Materials

Hardened with Oligoamidoimides

18410250a Moscow PLASTICHESKIYE MASSY in Russian No 1, Jan 88 pp 10-13

[Article by P.A. Prudkay, A.F. Voloshkin, and Yu.S. Zaytsev]

**[Abstract]** It is possible to increase the heat resistance of epoxy polymers by introducing heterocyclic compounds such as imides into their structure. However, the possibilities of introducing them into epoxyoligomers are limited owing to complexities in synthesis and the low reactivity of such oligomers. It thus becomes simpler to introduce the imide cycles contained in polycarboxylic acids and their anhydrides, which are used as hardeners and which have a higher reactivity than do the epoxyoligomers. In the present work a study was made of the effect of the structure of the amide component of oligoamidoimido hardeners obtained by condensation of pyromellitic acid with aromatic diamines of various structure on the aging process and the properties of the hardened molding materials subjected to sustained heating at 523-573 K. The amine components consisted of o-, m-, and p-phenylenediamines and various diamines. The reaction speed for preparation and cyclization of polyamide acids increases in high-boiling aprotic solvents such as dimethyl formamide, and the degree of imidization may be increased by raising the temperature and duration of condensation. However, when dianhydride and diamine are in a 2:1 molar ratio, the solubility of the oligoamidoimides decreases as the molecular weight and degree of cyclization decrease, so that partial precipitation was observed. Negative effects of the solvent on the

heat resistance of molding materials are lessened considerably by using ethyl cellulose and acetone. The heat resistance of molding materials therefore depends greatly on the type of solvent used during preparation of the hardener and the structure of the amide component in the hardener. Figures 3; references 10: 8 Russian, 2 Western.

12765

UDC 678.5-408:621.793

**Surface Pretreatment of Polymers Prior to Electrochemical Metallization (Review)**  
*18410250c Moscow PLASTICHESKIYE MASSY in Russian No 1, Jan 88 pp 31-33*

[Article by M.S. Guseva, A.G. Liakumovich, and B.S. Fridman]

[Abstract] Metallization of plastics and other dielectric materials by chemical means is an important technological step in the production of electronic components and the decoration of plastic objects. Substitution of metallized plastics for nonferrous metals and light alloys provides a great savings (as much as 10 rubles/m<sup>2</sup>) since plastics are only half as costly and severalfold lighter in weight than their metallic counterparts. Metallized plastics are widely used in the automotive and tool industries. Plastics with special metallic coatings are used in various branches of industry. Printed circuits, matrices, and waveguides are produced by metallization of ABS plastics, while metallized phenolformaldehyde, lavsan, and polyimide molding materials are used to make typesetting forms. The greatest expense in the production of metallized plastics lies in the metallization process itself, with the cost depending on the efficiency of the technology used, the shape of the object, and the type of coating being applied. Chemical metallization in aqueous solutions, where metal ions are reduced with a reducing agent, is the most achievable method metallization of plastics. Of prime importance is the preparation of the polymer surface for metallization. This includes abrasion to roughen the surface; chemical treatment with acids, alkalis, and complex compounds and solvents to increase adhesion of the coating to the polymer; and degreasing with organic solvents or aqueous alkalis and emulsifiers to remove contaminants. The present review covers these and other methods such as pickling to alter the physicochemical properties, surface

activation to initiate autocatalytic reduction of the metal, and phosphatization to increase resistance to delamination and high temperatures. References 37: 17 Russian, 20 Western.

12765

UDC 678.06:62.229.272

**Making Nonreinforced Threaded Joints**  
*18410250d Moscow PLASTICHESKIYE MASSY in Russian No 1, Jan 88 pp 58-59*

[Article by S.V. Leonov]

[Abstract] Threaded joints are a simple and cheap means of joining. A study examined the feasibility of making threaded joints by "cold" forming a smooth hole. The characteristics of the holes formed in this manner were also studied. Samples of Diflon polycarbonate and polyamide with smooth holes 2.5-2.8 mm or 3.4-3.7 mm in diameter were made by pressure casting at 240-280 degrees C (melt temperature), 80 degrees (mold temperature), and 80-90 MPa pressure for the polycarbonate, and 250-300 degrees C (melt temperature), 80 degrees C (mold temperature), and 120-150 MPa pressure for the polyamide. Metric thread screws and wood screws were used as dies. To improve their quality and dependability, the threaded joints were heat treated with boiling water for 6 hours and dried at 110 degrees C for 24 hours. Tests were conducted on a tensile testing machine under simulated service conditions. Thermal aging was conducted at 125 degrees C for 250 hours; service temperatures ranged 25-145 degrees C. Each type of polymer has its own optimum hole diameter at which maximum retentive force is reached. As the smooth hole diameter is increased, the torsion force retaining the screw decreases as a result of the diminishing contact area of the metallic fastener with the polymer. With increasing diameter, shear stress increases significantly, leading to delamination of the polymer at the interface with the forming screw during screw tightening. Raising the service temperature from 25 to 145 degrees C results in deterioration of the strength properties of the threaded joints owing to irreversible plastic deformation. Thermal aging at 125 degrees C for 250 hours improves thread quality due to relaxation of residual and shear stresses. Higher-quality threads may be obtained with polycarbonates by using GKZh-94 lubricant. For M3, M4, and Sh4 threads, the smooth holes must be 2.6, 3.5, and 3.4 mm diameter, respectively. The "cold" forming method eases some of the difficulties in fabricating parts without lowering the integrity of the threaded joint. Figure 1.

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**Initial Retention and Accumulation of Radionuclides by Plants Irrigated by Sprinkling**  
*18410316a Moscow AGROKHIMIYA in Russian No 4, Apr 88 (manuscript received 15 May 87) pp 98-102*

[Article by N.I. Sanzharova, V.K. Kuznetsov, R.M. Alekseev, and G.P. Perepeltyatnikov, North Kazakh Phytopathology Scientific Research Institute, Krasnodar]

[Abstract] The accumulation of radionuclides in crops is largely determined by their initial retention in plants. Initial retention is dependent on their morphological peculiarities, development phases, and certain irrigation parameters. Although the latter factor has been discussed in the literature, many aspects of the behavior of radionuclides in the system irrigation water-plant remain poorly studied. Accordingly, field experiments were carried out in the Northern Caucasus for determining the influence of irrigation mode on initial retention and accumulation of radionuclides by plants irrigated by sprinkling. A study was made of the influence of sprinkling time on the initial retention and accumulation of  $^{65}\text{Zn}$ ,  $^{89}\text{Sr}$ ,  $^{106}\text{Ru}$ , and  $^{134}\text{Cs}$  in corn, alfalfa, beet, and tomato crops. It was found that the retention of radionuclides by an above-ground plant mass irrigated by sprinkling increases in the late vegetation phases and attains 40 to 80 percent of the total quantity of radionuclides to which the crops were exposed. With respect to the values of the initial retention coefficient, the radionuclides form the series:  $^{65}\text{Zn}$  is greater than  $^{134}\text{Cs}$  is greater than  $^{106}\text{Ru}$  is greater than  $^{89}\text{Sr}$ . Initial retention by the above-ground mass is influenced by the physico-chemical properties of the radionuclides, the above-ground mass of the plant during the sprinkling period, and sorption properties of the surface of above-ground organs; these change with plant age and intensity of metabolic processes. With respect to the specific initial retention coefficient, the crops form the series: alfalfa is greater than corn is greater than beet is greater than tomato. This index for some crops and some radionuclides remains constant during the growing season, but for some plant species decreases in the later ontogenesis phases. An increase in watering from 100 to 500 m<sup>3</sup>/hectare results in a decrease in the primary retention coefficient in the above-ground plant mass, the sharpest decrease occurring with an increase in watering from 100 to 300 m<sup>3</sup>/hectare. A further increase in watering results in a lesser influence on the initial retention and accumulation of radionuclides in crops. References 8: 5 Russian, 3 Western.

5303

UDC 541.124

**Kinetics of Radiation Charging of Disordered Dielectrics under Conditions of Continuous Irradiation**  
*18410343d Moscow ZHURNAL FIZICHESKOY KHIMII in Russian Vol 62, No 4, Apr 88 (manuscript received 9 Jul 87) pp 1094-1096*

[Article by V.I. Arkhipov, A.I. Rudenko, and D.V. Khramchenkov, Moscow Engineering Physics Institute]

[Abstract] The wide use of dielectrics in instruments operating in ionizing radiation fields has created an

interest in studying the kinetics of their radiation charging. Most dielectrics that are currently being used in practical applications are disordered materials whose localized states have a broad energy spectrum. Transfer occurs in such materials over long time intervals with nonequilibrium localized carrier energy distribution, requiring analysis of charge accumulation kinetics in irradiated dielectrics in the dispersed mode. This article presents a theoretical study of disordered dielectric radiation charging kinetics in specimens bombarded with charged particle fluxes slowing and thermalizing in a narrow surface layer. An equation is derived that describes the electric field dynamics and space charge density in the dispersion transport mode. Approximate analytic and numerical solutions of the equation are obtained. The solutions allow analysis of the variation of voltage across the specimen with time. It is shown that the curve describing the increase in voltage has two characteristic sections: A near-linear initial section and an essentially nonlinear final section, with the nonlinearity being localized states' depth of energy distribution. The linear increase in voltage in the initial time interval is caused by the fact that almost all of the injected carriers are near the cathode, and the field in the specimen is a homogeneous field that increases in proportion to time given a constant gun current. The later drift of carriers deep into the specimen hinders the field increase, first near the cathode and then throughout an increasing volume. This in turn causes the voltage to rise more slowly than does a linear function of time, after which some of the injected carriers reach the anode and leave the specimen. The number of carriers leaving the specimen increases more slowly than the number of carriers injected, causing a reduction in voltage rise rate. Figures 2, references 4: Russian.

6508

UDC 631.811.98

**Sr<sup>90</sup> in Global Soil and Radiological Estimate of Its Behavior and Migration**  
*18410245a Moscow AGROKHIMIYA in Russian No 1, Jan 88 (manuscript received 13 Feb 87) pp 85-89*

[Article by N.A. Bakunov, Agrophysics Scientific Research Institute, Leningrad]

[Abstract] Most studies on the agrochemistry of nuclear fission products have been carried out by artificially adding radionuclides to soil in field tests. It therefore seemed interesting to consider the global level of radioactive soil contamination when studying radiological problems in agrochemistry. The accumulated reserve of long-life isotopes ( $\text{Sr}^{90}$ ,  $\text{Cs}^{137}$ ) in the soil presents a unique bench mark in the upper level of soil cover, making it possible to study the migration of these nuclides in the overall activities of man. In the present work, a study examined the possibility of incorporating data on the background contamination of soils and

plants with Sr<sup>90</sup> and Cs<sup>137</sup> when solving selected individual problems in the agrochemistry of nuclear fission products. Data on the Sr<sup>90</sup> contamination of soil and harvests were used. On the basis of the change in the radionuclide ratio of Cs<sup>137</sup> to Sr<sup>90</sup> over time, an effective period of 8-14 years was detected for the half-life of Sr<sup>90</sup>.

Possible limits of arable soil contamination may then be determined by calculations using data on these radionuclides. References: 12 Russian.

12765

**Socialist Pledge of Organic Chemistry Institute,  
AN USSR**  
*18410234 Kiev RADYANSKA UKRAYINA in Ukrainian  
20 Jan 88 p 1*

[Article under the "Meeting of the 19th Party Conference" rubric: "Science's High Mission: Socialist Pledge of the Collective of the Organic Chemistry Institute, UkrSSR Academy of Sciences"]

[Text] Having unanimously approved the Party policy of perestroyka and comprehensive acceleration of scientific and technical progress and getting ready to meet befittingly the 19th Party Conference, the collective of the Organic Chemistry Institute, AN USSR, is hereby making the following socialist pledge for 1988:

Fulfill the 1988 scientific program ahead of schedule, by December 20.

Implement in agricultural production new plant growth regulators (ivin-yan, dextrel and ivin-kh) on at least 2,000 hectares to effect crop increases as follows: vegetables, by 36-48 metric centners per hectare of open soil and by 0.5-1.7 kg/m<sup>2</sup> of greenhouses; potatoes, by 20-60 metric centners per hectare. Above the plan, develop a manufacturing method, prepare technical documentation, and make an experimental lot of efficient acrycide for try-out in controlling a dangerous bee pest in Ukrainian bee gardens.

By the opening date of the 19th Party Conference implement in production a new thermal stabilizer that prolongs the service life and thermal stability of polymer materials, with savings of 800,000 rubles.

In order to increase the contribution of basic sciences to medicine development, develop above the plan and deliver for clinical testing a method for practical assessment of the efficiency of antialcohol preparations and a technique that makes it possible to choose the optimum dosage of drugs when treating chronic alcoholics. Conduct comprehensive investigation of a new hemostatic preparation developed by the Institute. Make a necessary lot of ethomorsole, an efficient means for improving work capacity, and deliver it to medical offices for clinical testing.

Complete work on 50 contracts for S&T cooperation, including 13 contracts with Kiev enterprises and organizations. Prepare 2 Doctors and 10 Candidates of Sciences. Compile a Republican interagency collection of papers "Fiziologichno actyvni rechovyny" [Physiologically Active Substances], and send to publishers 160 scientific papers. Test at least 250 new compounds for the presence of useful properties.

As a result of implementing the Institute's developments into the country's national economy, realize savings in the amount of R14.15 million.

Compile a scientifically justified list of necessary chemical methods for plant protection that result in the least pollution of agricultural products and environment, and deliver it to professionals at the "Ploskivskyy" sovkhoz (Bровары rayon, Kiev oblast).

Assist schools under the Institute's patronage in equipping chemical classes, organizing chemical societies, and guiding students' professional orientation and patriotic upbringing.

In accordance with the "Zdorovye" [Health] program, take measures for reducing illnesses among Institute's workers and time lost due to temporary disability by at least 3% as compared with 1987, and provide professional medical checkups for those working under hazardous conditions.

The Institute's collective calls upon scientists at the AN USSR institutions and all scientists in the Republic to actively participate in the socialist competition, fulfill their 1988 plans and socialist pledges ahead of schedule, and meet befittingly the 19th Party Conference.

[Photo caption] Successful fulfillment of collective's pledges, particularly those items that deal with implementation of new plant growth regulators into agricultural production, depends to a large extent on coordinated work of theoreticians-scientists and practical specialists. Their effort is coordinated by such subdivisions as, for instance, the Laboratory for Biological Testing of Chemical Compounds (Laboratory Head, Candidate of Biological Sciences V. Petrenko). Here, developments by the Institute's chemists are carried to practical completion, and properties of synthesized substances are tested. From hundreds of studied specimens, the most efficient chemical agents for plant protection and growth regulation are selected. The photo shows Laboratory Head V. Petrenko and Senior Technician T. Malyovana studying the effect of various preparations on plants under greenhouse conditions.

**Comment by Academician Secretary, Chemistry and Chemical Technology Department, Academician, AN USSR, V.P. Kukhar:**

Accelerated development of the basic research of urgent problems of the chemical science combined with efficient and specific solutions of practical problems are typical of the today's work style of the collective of scientists and professionals at the Organic Chemistry Institute, AN USSR. Only when acting from the position of in-depth and comprehensive knowledge can one create new substances and materials and keep developing S&T progress.

In recent years, the Institute has stirred up its activity in developing biologically active preparations. The collective's 1988 pledge is the best reflection of this huge and strenuous work. Here, original domestic plant growth regulators and biological methods for pest and disease

control are being given a start in life as they are sent to the country's and Republic's kolkhoz and sovkhoz fields. They make significant contributions to meeting the targets of the Food Program. Sovkhoz "Ploskivskyy," which is under the Institute's patronage, feels that this very patronage is business-like and scientific rather than help in the form of "labor landings".

The Institute's work on creating new medical preparations is filled with care for the Soviet people's health. In this area too, the collective has done a good job, which is based on the in-depth development of problems and comprehensive cooperation with medical science and practice.

Attention to personnel training, especially to training of talented young people, and care for solving social problems combined with active work along strategic directions of scientific search attest to the collective's high potential. This is why there is no doubt that scientists and all workers at the Organic Chemistry Institute, AN USSR, will honorably fulfill their socialist pledge.

12770

UDC 547.422+543.422.4

**Three-Dimensional Structure of****1,2-Dihydro-3H-1,4-benzodiazepine-2-ones**

18410276b Kiev DOKLADY AKADEMII NAUK  
UKRAINSKOY SSR: SERIYA B in Russian No 1.  
Jan 88 (manuscript received 3 Aug 87) pp 33-35

[Article by Corresponding Member UkrSSR Academy of Sciences S.A. Andronati, I.A. Prokopenko, A.S. Yavorskiy, O.G. Khvostenko, and I.Ye. Boldeskul, Physical Chemistry Institute, UkrSSR Academy of Sciences, Odessa]

[Abstract] Many derivatives of 1,2-dihydro-3H-1,4-benzodiazepine-2-one possess well-expressed psychotropic properties (anxiolytic, antispasmodic, soporific, myorelaxant, and others). The mechanism of action of these preparations has been studied intensively for the past 10 years, and information on the spatial composition and fine structure of dihydrobenzodiazepines is very important for this type of research. X-ray analysis and spectroscopy indicate that the title compound does not have a one-dimensional structure. All benzodiazepinones studied have a pseudo-tub structure. Those having no substituents in the N<sub>1</sub>-position form cyclic dimers in the crystalline state by means of the hydrogen bonds between their amide groups. Linear associates and monomer molecules have been detected in solutions. There is an almost unified notion in the literature that benzodiazepinones have a pseudotub configuration with the possibility of the existence of various three-dimensional forms of this compound. It has been established that in the gaseous state these compounds exist in two nonequivalent forms that are in equilibrium with each other. A change in temperature increases the fraction of one over the other. It has been hypothesized that one form has a Z-shape and the other an E-shape. In the present work the IR-spectra of eight benzodiazepinone derivatives in carbon tetrachloride confirmed the existence of these configurations. Figure 1; references 7: 6 Russian, 1 Western.

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